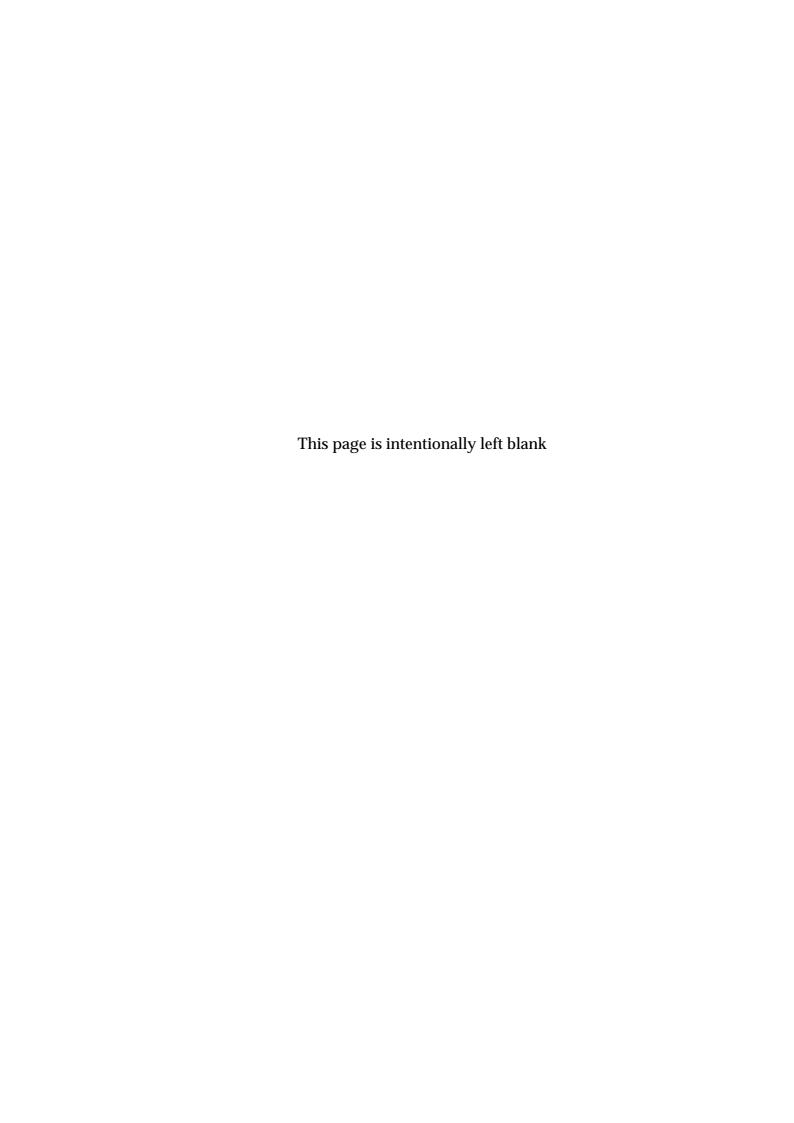
Simrad AP11 Autopilot A KONGSBERG Company ALWAYS AT THE FOREFRONT OF TECHNOLOGY



Instruction Manual

This manual is intended as a reference guide for operating and correctly installing the AP11 autopilot.

Great care has been paid to simplify operation and set-up of the Robertson AP11, however, an autopilot is a complex electronic system. It is affected by sea conditions, speed of the vessel, hull shape and size.

Please take time to read this manual to get a thorough understanding of the operation and system components and their relationship to a complete AP11 autopilot system.

Other documentation materials that is provided with your system include a warranty card. This must be filled out by the authorized dealer that performed the installation and mailed in to activate the warranty.

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1 INTRODUCTION

1.1 General

Congratulations on the purchase of your new AP11 autopilot system and thank you for selecting a Robertson autopilot for your boat.

Today Simrad manufacture a complete range of autopilots for all types of vessels, from leisure boats up to advanced steering systems for merchant marine vessels. Our factory for these products – branded Robertson – is located in Egersund on the south/west coast of Norway. The company's involvement in autopilots began in 1953 with equipment for the North Sea fishing fleet. Professional mariners around the world acknowledge that the Robertson name is synonymous with the absolute best in autopilot technology.

The design of the AP11 Control Unit matches perfectly with the IS11 instrument range made by our sister company Simrad Ltd, located near Portsmouth in the United Kingdom. The combination of AP11 and IS11 instruments provide power and sailboats from 30-45 feet with virtually all functions and features required in automatic steering and navigation today.

The brain in the AP11 autopilot system is a single "intelligent" J3000X (or J300X) Junction Unit that communicates with the AP11 Control Unit and interconnects all other system modules. It provides power to a various and well proven selection of drive units; electromechanical and electrohydraulic with reversible motor or constant running pump with solenoid valves.

Dual station applications can be satisfied by adding an additional full function control unit at the second station. A separate hand held remote control with MANUAL/AUTO mode selection is also available as a useful supplement to the operation of the AP11 Autopilot.

Rotary or linear rudder feedback units provide a high resolution and precise rudder angle signal, an important factor to the enhancement of the AP11 autopilot steering capabilities.

The AP11 autopilot system includes NMEA0183 input and output ports. The NMEA input allows a single navigation receiver and speed and wind sensors to provide input to the system. The NMEA output provides heading and rudder angle to separate IS11 instruments or to the IS11 Databox. Depending on the autopilot configuration and the equipment that may be connected to the NMEA input, other NMEA data may also be available at the NMEA output.

The time proven experience of the Robertson engineers and the computer power in the AP11 system has made it possible to automate and simplify the setup and installation procedures. One important feature is the capability to set up automatically the steering parameters and select the scaling factor for speed and hull type; power (planing or displacement) or sail. Proportional rate output commands and an adaptive sea state filter contribute to enhanced steering performance in any sea condition.

1.2 System Components

A basic AP11 autopilot system consists of: AP11 Control Unit, J3000X or J300X Junction Unit, RF300 Rudder Feedback Unit, RFC35 Fluxgate Compass and Drive unit.

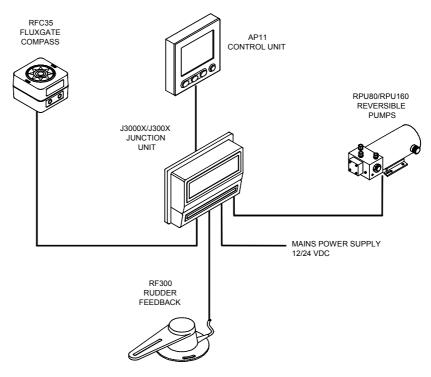


Figure 1 AP11 Basic system

1.3 AP11 Control Unit

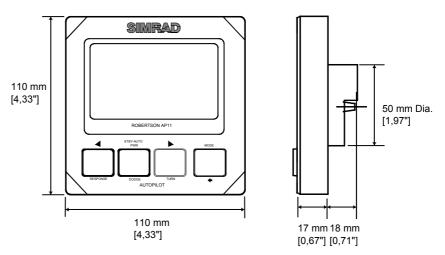


Figure 2 Control Unit Dimensions

A compact autopilot control for panel or bulkhead mounting. Large LCD display for readout of autopilot data.

1.4 J3000X and J300X Junction Unit

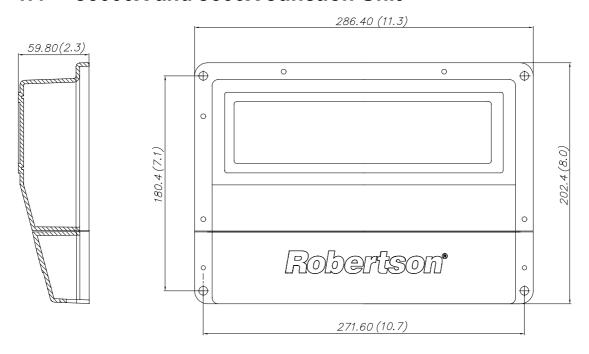


Figure 3 J3000X and J300X dimensions

The junction unit is the heart in the AP11 autopilot system. It contains the steering computer, interface circuits to all system components and drive circuits for the drive unit motor and clutch. Two models, J300X and J3000X are available.

	J3000X	J300X
Supply voltage	10-28 V	10-28 V
Motor current (continuous/peak)	6/10 A	10/20A
Number of control units	2	2
NMEA ports	1	2
Input for NFU control	x	х
External alarm		Х
Radar clock/data interface (Anritsu and Furuno radars)		х

Table 1 Junction unit comparison chart

1.5 RF300 Rudder Feedback Unit

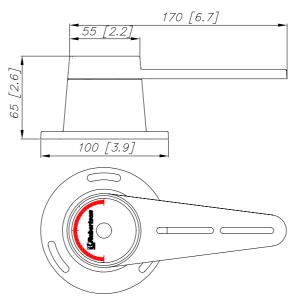


Figure 4 RF300 Dimensions

Rudder feedback unit with transmission link and 10 m (30 feet) of cable. Transforms the angular travel of the rudder to a digital signal read by the autopilot steering computer. (See also optional linear feedback on page 13).

1.6 RFC35 Fluxgate compass

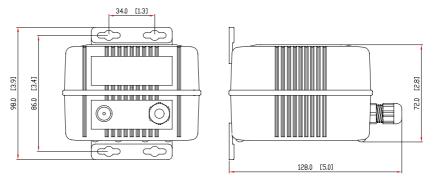


Figure 5 RFC35 Dimensions

A compact heading sensor from Robertson with 15 m (45 feet) of cable. The direction of the earth's magnetic field is sensed by a coil with a floating ring core and transformed to a digital signal read by the autopilot steering computer.

1.7 Optional components

CDI35 Course Detector Interface

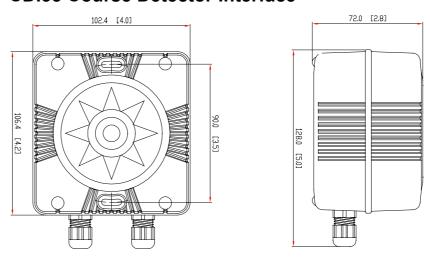


Figure 6 CDI35 dimensions

Interface unit to connect autopilot to magnetic compass with CD100 Course Detector. Provides excitation current for CD100 and converts the analogue sin/cos signal to digital format for the autopilot steering computer.

RFC35R Rate compass

Fluxgate compass with integrated rate sensor. Provides a dramatic improvement to the dynamic performance of both the autopilot and a stabilized radar display.

Same dimensions as RFC35.

LF3000 Linear Feedback



Figure 7 LF3000 dimensions

Linear feedback unit for boats with outboard engine. Transforms the linear movement to an analogue signal. Supplied with 8,5 m cable and mounting clamps.

LFI3000 Mk2 Linear Feedback Interface

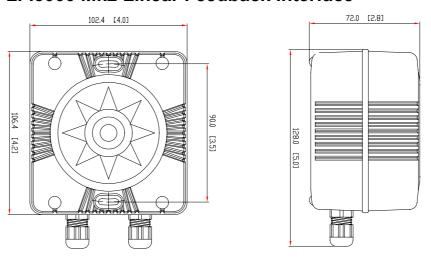


Figure 8 LFI3000 Mk2 dimensions

Interface unit for LF3000 Linear Feedback. Converts the analogue LF3000 signal to the standard digital feedback signal for the autopilot steering computer.

"Rudder" Indicator

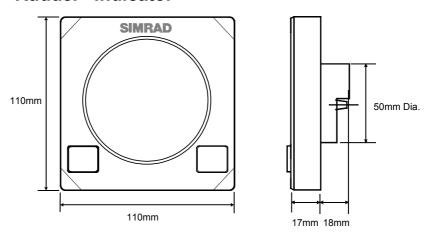


Figure 9 Robertson IS11 analogue display dimensions

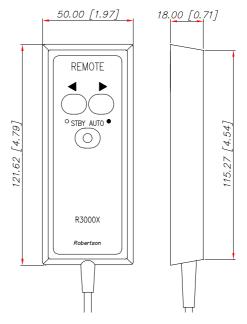
A 12 V Dataline instrument that can be connected directly to the NMEA output on the junction unit. Analogue display of boats' rudder angle.

"Compass" Indicator

A 12 V Dataline instrument that displays the boats heading on both digital and analogue format. Can be connected directly to NMEA output on the junction unit. Dimensions as for "Rudder" Indicator.

R3000X Remote Control

small hand-held remote control with two push buttons for power steering or course selection (port and starboard) and one push button with built-in lighted indicator for mode selection.



S100 NFU steering lever

Designed for in-door console mount. The lever has spring loaded return to mid-position.

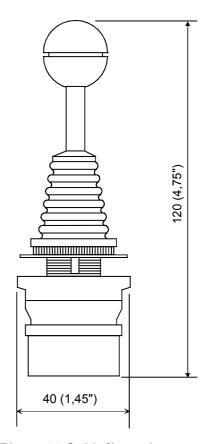


Figure 11 S100 dimensions

2 AP11 AUTOPILOT OPERATION

WARNING!

An autopilot is a very useful navigational aid, but DOES NOT under any circumstance replace a human navigator.

Do not use automatic steering when:

- In heavy traffic areas or in narrow waters
- In poor visibility or extreme sea conditions
- When in areas where use of autopilot is prohibited by law

When using an autopilot:

- Do not leave the helm unattended
- Do not place any magnetic material or equipment near heading sensor used in the autopilot system
- Verify at regular intervals course and position of vessel
- Always switch to Standby mode in due time to avoid hazardous situations

2.1 Overview

The AP11 Control Unit can be used in single or dual station installations. A hand held, push button operated remote control provides manual steering in STANDBY- mode and course change in AUTO mode. In a multi station system all control units and the remote(s) are active simultaneously; however, the control unit(s) that are not being operated will then display a flashing REMOTE.

The AP11 autopilot system is capable of the following steering modes: STBY (standby), AUTO with heading source selection of COM (compass), NAV (navigation receiver), or W/A (wind vane).

In STBY mode push button steering is available directly on the control unit or on the remote control. Manual steering is also available using a steering lever. The basic operating concept in AUTO mode is that you will first select the heading source while in STBY mode, then switch to AUTO for automatic steering.

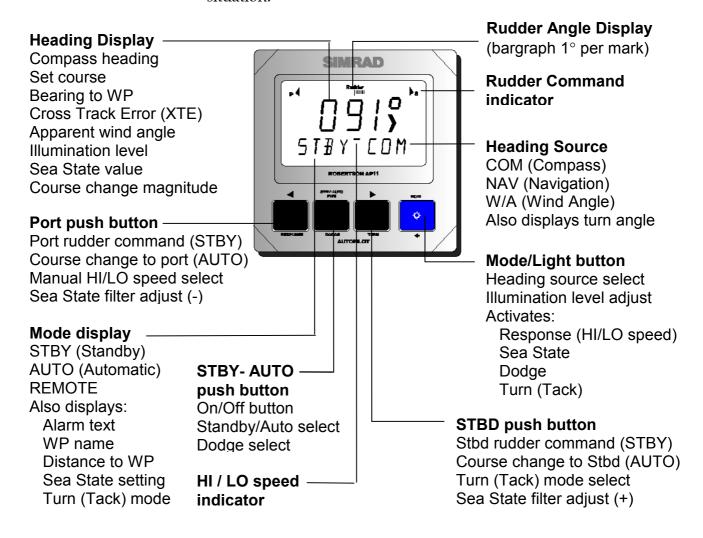
The system has two steering parameter sets referred to as HI and LO, corresponding to the speed of the boat. Selection of HI and LO speed parameters is done

automatically if speed data is available, or can be set manually by the user.

Three different backlighting colours are available for the LCD display and user settings are provided for lighting intensity and manual adjustment of steering parameters to "fine tune" the steering of a particular boat.

Alarms are presented in plain English text to alert you of system and external data failure conditions. Alarms will appear on all control units, and include both audible and visual presentations.

When underway in a AUTO mode, manual control of the vessel can be regained on any control unit, or by pressing the MODE button on the hand held remote control. It is also possible to switch off the complete AP11 system at the control unit, a very useful feature in an emergency situation.



2.2 On/Off

A single push on the STBY-AUTO/PWR button switches the AP11 Autopilot ON. The display will show STBY-COM and display the boats heading.

A long press (3-5 seconds) on the STBY-AUTO/PWR button switches the system OFF. As an additional safety, it is recommended that you locate the power breaker or mains switch before using the system for the first time.

2.3 Standby

The Standby mode is used for manual steering and provides Non-Follow-Up electric steering on any control head or a remote.

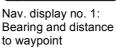
Note!

The AP11 autopilot will not process rudder commands or allow access to the AUTO modes if the Dockside settings in the Installation Setup has not been set properly. The display will also flash NO DATA in STBY NAV and STBY W/A if appropriate NMEA signals are not available as input to the system.

You can cycle through the Standby mode displays and nav. displays by a short press on the MODE button.









Nav. display no. 2: Cross Track Error (XTE) and name of waypoint

2.4 Standby- Compass mode



The (STBY-COM) mode is always entered when the AP11 is turned on. It is also the mode that is used when steering the boat manually.

The rudder angle is shown on the bargraph and the compass heading is displayed and continually updated as the boat turns.

2.5 AP11 with MSD50 Stern Drive unit

Note!

The information on this page only applies if your autopilot is driving a Robertson MSD50 Stern Drive.

The MSD50 Stern drive unit has a relative feedback signal which needs a zero point setting after the autopilot has been turned on. Refer to page 1-1 of the MSD50 manual for further information.

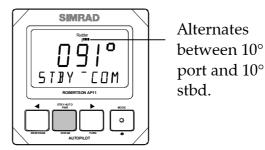
Zero point setting

Note!

If you do not need a rudder angle display when leaving the dock, just steer the boat manually on a straight course and press the STBY-AUTO button. The zero point is then set automatically.

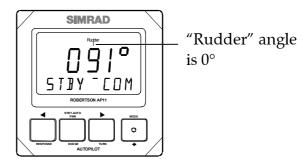
If you prefer to use the rudder angle display when leaving the dock, proceed as follows:

After turn on the rudder angle display will alternate between 10 degrees port and starboard to indicate that the "rudder" zero point need be set.



Use the wheel to bring the "rudder" to midship position. Turn the wheel from lock to lock (H.O. to H.O.) and count the exact number of turns. Then start from one lock position and turn the half number of turns.

Press the STBY-AUTO button two times with an interval of approx. 2 seconds. The zero point is now set and the display will show:

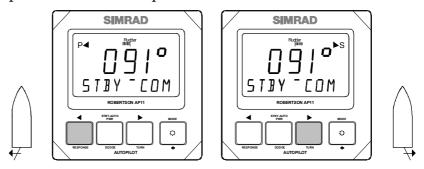


Operation

Follow the operating instructions on the following pages. There is no further need for zero point settings until next time you turn the autopilot on.

2.6 Non-Follow-Up electrical steering

Non-Follow-Up (NFU) steering is when you control the rudder by a push button or a steering lever (also called time dependent steering). The rudder will move as long as you press the button or operate the lever.

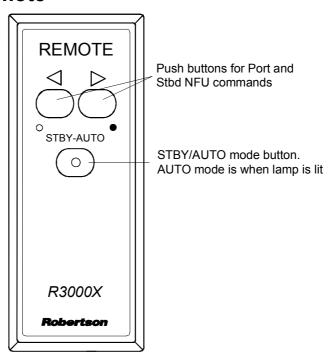


When the < (Port) or > (Stbd) push button is pressed, the rudder will move until the button is released. The Rudder Command indicators will show the direction of the rudder command and the actual rudder angle is shown on the bargraph (1° per division up to $\pm 20^{\circ}$).

2.7 NFU Steering Lever

The rudder will move as long as the lever is offset to Port or Starboard.

2.8 Hand held remote

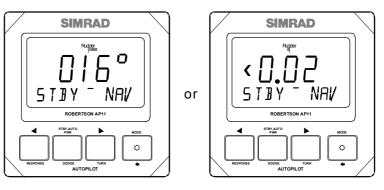


Note!

When in AUTO mode, pressing the buttons will change the set course 1° each press. If you keep the button pressed, it will automatically change the course at a rate of 3°/second. Refer to page 35 for further information.

2.9 Standby-Nav mode

When a Navigation receiver is connected to the AP11 you can steer the boat manually using the STBY-NAV mode display(s) as shown, or you can steer the boat automatically using the Nav. receiver signals to adjust the boats course to steer (see page 28).



Bearing waypoint - waypoint

Cross Track Error (XTE)

The bearing waypoint to waypoint is only displayed if the Nav. source is transmitting valid data. If bearing is not available, the XTE display will show the magnitude of the cross track error and direction to steer back to track.

2.10 Standby - Wind mode

This mode is available <u>only</u> when a valid wind source is connected and when the boat type has been set to sailboat in the Installation Menu



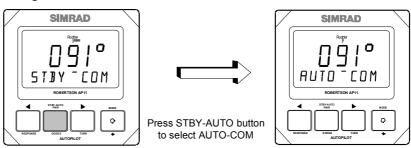
The display will show apparent wind with Stbd (shown) or Port arrow to indicate the direction the wind is coming from.

2.11 Automatic Steering

The AUTO modes are used when you want the AP11 to steer the boat automatically. Three different AUTO modes are available dependent on the type of boat and the configuration of your AP11 Autopilot system.

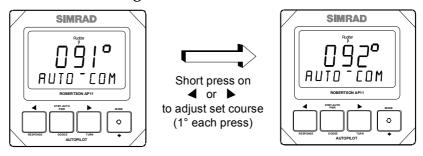
2.12 Auto Compass mode

If needed, press the MODE button to select STBY-COM and put the boat on a straight course prior to entering the Auto Compass mode.



When the AP11 is in Auto Compass mode the displayed heading is the <u>set</u> course and the compass is the heading source for automatic steering.

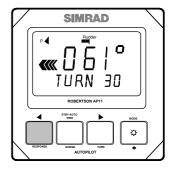
Small course changes:



With the button pressed the set course automatically changes in 1° steps with a single beep at each step.

Large Course Changes:

Press and <u>hold</u> < or >. The display will change from AUTO-COM to TURN 0. You may now change the course in 10° steps (10/20/30) by a single press on the < or > button. A double beep tone will sound at each press and the arrow(s) will show the direction of the turn.



Alternatively you may keep the < or > button pressed and the course change is made automatically in 10° steps.

When arriving within 10° of the new set course the display will change from TURN to AUTO-COM. You may then proceed with small (1°) course changes to set the final course.

To re-take manual control, make a short press on the Stby-Auto button to select STBY-COM.

Nav. displays in Auto Compass mode



Press the MODE button to bring up the first nav. display. This display shows the bearing and distance to next waypoint. Press the MODE button once more to bring up the second nav. display which shows Cross Track Error (XTE) and waypoint name. A new press on the MODE button will bring back the AUTO-COM display. If the MODE button is <u>not</u> pressed within 15 seconds after having activated one of the nav. displays, it will automatically return to the AUTO-COMP display.

Pressing the STBY-AUTO button from one of the nav. displays, returns the autopilot to STBY-COM mode.

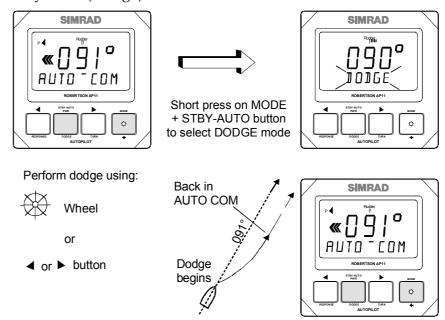
2.13 Dodging

The AP11 provides the capability for dodging. The Dodge function allows the user to temporarily take manual control of the boat's steering, when steering automatically on a set course. Dodging is very useful in situations where you need to quickly take control of the helm to steer around an obstruction, and then wish to return on the previous set heading after performing the evasive maneuver.

Note!

Dodge is available in all Auto modes.

Dodging is activated by a simultaneous press on the Stby-Auto (Dodge) and Mode buttons.



Short press on Stby-Auto and Mode buttons at the same time to return to Auto Compass mode and recall last set course.

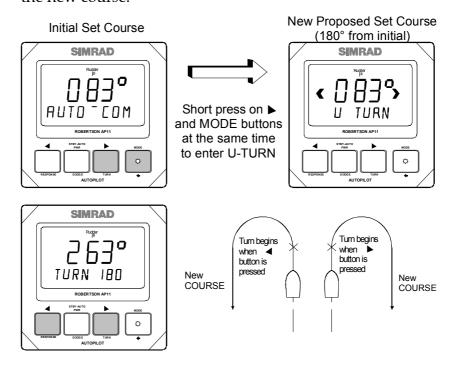
Note!

If you press the Stby-Auto button only, the autopilot will continue in Auto mode on the new course without recalling last set course.

2.14 U-Turn

The AP11 also provides a special U-turn feature that is available when the AP11 is in the AUTO mode. (If boat type set to "SAIL" in the installation set-up, a Tack function replaces the U-turn).

U-Turn changes the current set course to be 180 degrees in the opposite direction. The user may decide if the U-turn should be made to Port or Starboard to bring the boat on the new course.



TURN 180 appears in display until vessel is within 10° of new heading.

The total turn can be adjusted in 10° steps during the turn.

Cancel U-Turn and return to STBY-COM by pressing Stby-Auto button.

If no U-Turn is initiated within 30 seconds, the system returns to AUTO-COM mode on INITIAL Set Course.

Note!

2.15 Tacking in Auto Compass mode

When the AP11 is installed on a sailboat, a fixed tack of 100 degrees can be made in AUTO mode.

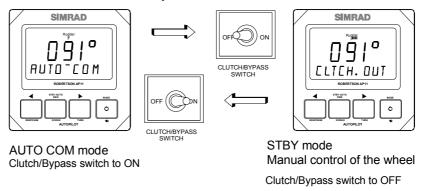
The use of this function should be carefully considered based on the boats characteristics and the weather situation. The tack function should only be used into the wind and must be tried out in good weather conditions with light wind to find out how it works on your boat. Due to wide range in boat characteristics (from cruising to racing boats) the performance of the tack function may vary from boat to boat.



Except for the course change of 100° and the difference in displays, the procedure is similar to that of the U-Turn described on the opposite page.

2.16 Clutch/bypass switch

In a sailboat this is a convenient arrangement if you want to take immediate control of the helm by hand when there is no control unit close by.



When the switch is set to ON again, the autopilot will return to AUTO mode accepting the <u>present</u> heading as set course.

Regain manual steering at any time by a short press on the STBY-AUTO button.

2.17 Navigating with the AP11

The AP11 has the capability to use steering information from an external navigator (GPS, LORAN, Decca) to direct the boat to a specific waypoint location, or through a route of waypoints. In the AUTO NAV mode, the AP11 uses the heading sensor as it's reference for course keeping. The steering information received from the external navigator alters the set course to direct the AP11 to the destination waypoint.

Note!

The process of having an external navigation receiver direct an autopilot can be a slow acting process. Navigational steering must therefore only be used in open waters.

To obtain satisfactory navigation steering, the following points must be fulfilled prior to entering the Auto Nav mode:

- The AP11 autosteering must be tested in Auto Compass mode and found satisfactory.
- The navigation receiver must be operating and the navigation system (GPS, LORAN, Decca) must be in full operating mode with adequate signal characteristics for valid position and steering data.
- At least one waypoint must be entered and selected as the current waypoint in the navigation receiver.

The AP11 is designed to steer in mixed mode operation. This combines the straight steering capability of cross track error (XTE) steering in conjunction with the turning capability of bearing mode steering. If the AP11 is connected to a Nav. receiver that does not transmit message with bearing to next waypoint, it will steer on the XTE message only. In that case you have to revert to AUTO mode at each waypoint and manually change set course to equal bearing to next waypoint and then select NAV mode again.

When operating in Auto Nav mode to automatically steer through a route of waypoints, the AP11 will steer to the first waypoint in the route after you accept the first waypoint as the location to steer to. When you arrive at the waypoint, the AP11 will sound an alarm and display the bearing to the next waypoint. If the course change exceeds 10°, you will need to verify that it is acceptable. If no verification is

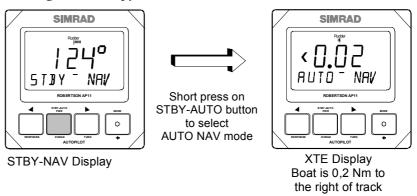
received, the AP11 will continue on the current set course in Auto Compass mode.

Note!

Steering through a route of waypoints with the AP11 allows you the total flexibility for automatic waypoint sequencing, but combines the safety feature of requiring operator acknowledge for course changes in excess of 10 degrees.

2.18 Auto Navigation Mode

Enter STBY mode and use the MODE button to select STBY NAV. Do not forget to set waypoint(s) on the navigation source prior to entering Auto Nav mode and make sure that you are reasonably on track and your heading is within 10° of bearing to the waypoint.



If bearing to selected waypoint requires less than 10° course change when entering AUTO NAV mode, the display will show Cross Track Error (XTE) in Nm. The arrow will indicate direction to steer back on track and XTE magnitude. If more than 10° course change is required, the course change is displayed and the MODE button must be pressed to acknowledge the course change.

SIMRAD SIMRAD Arrows show Press MODE direction that to acknowledge 75° boat will turn to course change reach next WP. NAV AUTO NEXT WP XTE Display Prompt displayed to advise **ORIGIN** required course change Boat is 0,1 Nm to the left of track after automatic (Audible alarm sounds) course change. **WAYPOINT 2** Bearing 75° WAYPOINT 1 Waypoint arrival zone (determined by the navigator)

At the arrival of each waypoint:

Regain manual steering at any time by a short press on the Stby-Auto button.

Nav. displays in Auto Navigation mode



Press the MODE button to bring up the first nav. display. This display shows the bearing and distance to next waypoint. Press the MODE button once more to bring up the second nav. display which shows Cross Track Error (XTE) and waypoint name. A new press on the MODE button will bring back the AUTO-NAV display. If the MODE button is <u>not</u> pressed within 15 seconds after having activated one of the nav. displays, it will automatically return to the AUTO-NAV display.

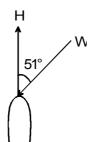
Pressing the STBY-AUTO button from one of the nav. displays, returns the autopilot to STBY-NAV mode.

2.19 Wind vane steering

In order to perform automatic wind vane steering the AP11 system must be operating in AUTO W/A mode, with valid input from wind sensor. The W/A function is an alternative to the NAV function and it is only available if the system has been set up for SAIL-boat in the Installation Setup Menu.

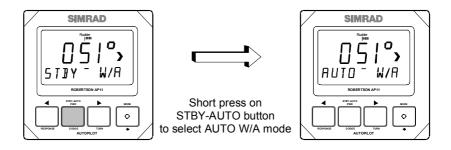
W/A function can only operate when reaching as it is necessary to have a stable apparent wind. The sails should be trimmed so that the autopilot easily can steer the boat in AUTO mode and the signal from the masthead must give a stable signal.

2.20 Auto W/A mode



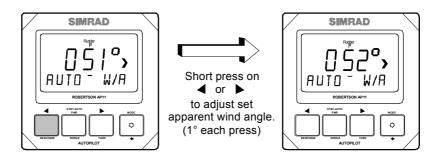
In the Auto W/A mode the boat is automatically following the set course using the compass as heading source. However, input from the wind vane will adjust the set course so that the apparent wind direction is kept constant.

Enter the STBY mode and use the Mode button to select STBY W/A.



Displayed angle is the apparent wind angle and the arrow indicates the direction the wind is coming from. In Auto W/A mode this angle is now the set (or reference) wind angle.

Changing set wind angle while in AUTO W/A mode:



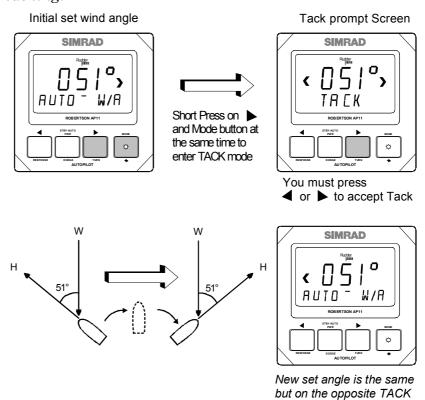
Alternatively: Press and $\underline{\text{hold}}$ < or > to adjust (jumps to 5° increments).

2.21 Tacking in AUTO W/A mode

The AUTO W/A mode on sail boats has also a tacking aid function. When activated it will take the boat from the course you are steering to a computed course that gives you the same apparent wind on the other side. This tacking function as compared to tacking in Auto Compass mode can only be used when you are sailing with the apparent wind as the reference, and with apparent wind angle less than 80-90 degrees.

Note!

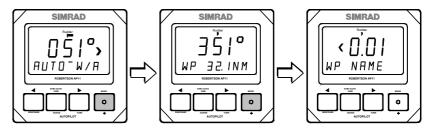
Refer to page 27 for particular considerations when tacking.



Note!

If tack is not accepted within 30 seconds, the display returns to **initial** AUTO W/A.

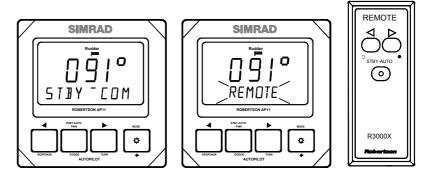
Nav. displays in Auto W/A mode



Press the MODE button to bring up the first nav. display. This display shows the bearing and distance to next waypoint. Press the MODE button once more to bring up the second nav. display which shows Cross Track Error (XTE) and waypoint name. A new press on the MODE button will bring back the AUTO-W/A display. If the MODE button is <u>not</u> pressed within 15 seconds after having activated one of the nav. displays, it will automatically return to the AUTO-W/A display.

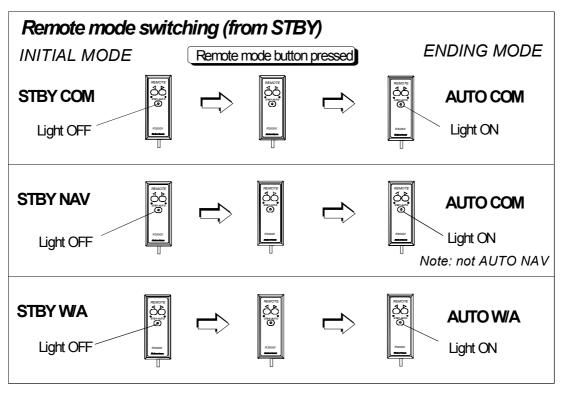
Pressing the STBY-AUTO button from one of the nav. displays, returns the autopilot to STBY-W/A mode.

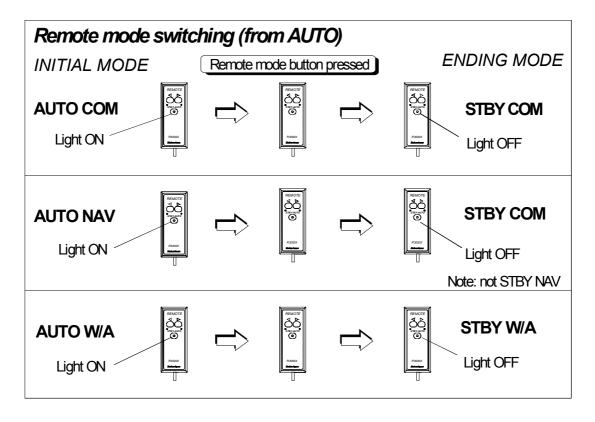
2.22 Multistation operation



In a multi station system all control units and the remote(s) are active simultaneously. The control unit that is not being operated will display the same as the one in operation, except for a flashing REMOTE. If a remote control is operated, the control unit (or both) will flash REMOTE.

2.23 Remote Control

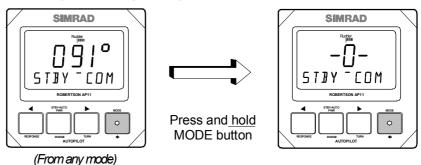




2.24 User settings

A group of user adjustable settings are provided in the AP11 autopilot. The settings are described below.

Display backlighting



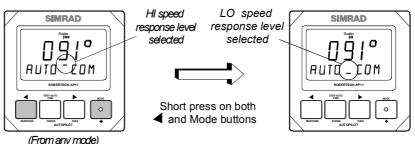
Lighting can be set to eight different levels: 0 (Off) - 7 (brightest). The display returns to the previous one when the Mode button is released.

Manual speed selection

Note!

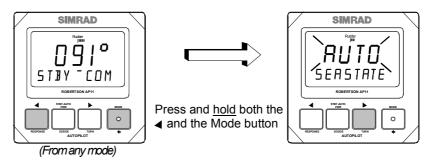
Prior to making a manual speed selection it is recommended that you study the "Transition Speed" paragraph on page 74 to get a clear understanding of the automatic speed selection feature.

The AP11 automatically selects the HI speed parameters at turn on. If you change boat speed it is recommended that you select HI or LO parameters correspondingly.



You can manually toggle between the two levels as shown. The manually selected steering parameter set (HI or LO) will remain in effect until AUTO mode is re-entered.

Manual selection of Sea State Filter



Select filter setting using < (decreasing) or > (increasing).

Filter setting	Description
OFF	Tightest steering. Most active rudder.
AUTO	Automatically sets autopilot sensitivity according to sea state (adaptive).
1	Lowest yaw band value that can be set manually.
10	Highest yaw band value that can be set manually (max. damping).

The AP11 will return to active mode by pressing the STBY/AUTO button, or it automatically times out after 30 seconds and returns to active mode.

Sea State Filter setting is stored in the autopilot memory when power is turned off and is recalled next time the system is used.

2.25 Alarms

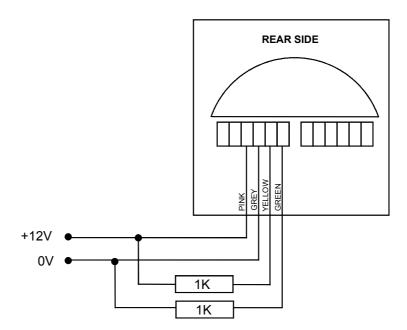
The software program in the AP11 is continually monitoring system input and output data as well as operational functions of the system. Audible and visual alarms are given in the event a failure is detected. The Heading Display will show a flashing FAIL whilst the Mode Display below will show an explaining text.



The audible alarm is reset by pressing the Mode button or by changing mode from e.g. AUTO to STBY. The visual alarm will now display "Err." and alternate in 3 seconds every 12 seconds with the operating display until the fault has been rectified. Consult the Trouble Shooting section, page 88 for hints and try to solve the problem yourself. If the problem turns out to be too complicated, consult your nearest Simrad Robertson dealer for assistance.

2.26 Demo mode

The software in the AP11 Control Unit also contains a demo programme that enables a full demonstration of the functions and features. All you need is a 12V DC power supply and two 1K resistors connected as pr. figure; no junction unit, compass or feedback is needed.



The Demo mode is activated the following way:

• Turn on the power supply while the Port button is pressed.

(Note: The demo unit can only be turned off by switching off the supply)

- Keep the button pressed until the fault warning "Fail Data Comm" is shown.
- Reset the fault warning by pressing the Mode button.

You may now operate the AP11 in all modes without activating any alarms or fault warnings. Please refer to previous pages for operating instructions.

The Demo programme is simulating a boat sailing at a speed of 10 knots. Initial heading is 000 (North).

Using the Port and Stbd buttons in Stby mode will generate a rudder angle on the display and the heading will change accordingly.

Course change, Dodge, U-turn etc. can be demonstrated in Auto mode.

In Nav mode you can sail to a waypoint at a bearing of 270 degrees.

In Wind mode the wind is permanent from North.

You may also enter the Installation menus and go through Dockside and Seatrial settings.

3 INSTALLATION

3.1 General

This section provides detailed information required to successfully install AP11 Autopilot system

The AP11 system includes modules that need to be mounted in different locations on the boat, and also need to interface with at least three different systems on the boat:

- The boat's steering system
- The boats electrical system (input power)
- Other equipment on board (NMEA interfacing)

In addition, the advanced capabilities of the AP11 require the installer to perform settings and tests to verify proper operation of the system, refer to the check list below.

3.2 Installation checklist

- 1. Determine system configuration you are installing (Page 42)
- 2. Hardware installation and electrical connections (Page 44)
- 3. Connect external NMEA devices (inputs and outputs, Page 59)
- 4. Dockside settings (Page 70)
 - a. Boat type selection
 - b. Drive volt selection.
 - c. Rudder feedback calibration.
 - d. Automatic rudder test.
 - e. Transition speed.
 - f. Test Non-Follow Up steering.
 - g. Test AUTO modes -Compass, -Nav, -Wind (W/A)
 - h. Test interface outputs to external equipment (if connected)

- 5. Sea trial settings (Page 76)
 - a. Rudder zero
 - b. Compass calibration
 - c. Compass (offset) adjustment
 - d. Automatic tuning (Optional, does not need to be done)
 - e. Viewing parameters
- 6. Testing Autopilot Operation at Sea (refer to Sea Trial instructions, Page 83)
- 7. Provide the user with training (Page 84)

3.3 Unpacking and handling

Care should be taken when unpacking and handling the equipment. A visual inspection should be made to see that the equipment has not been damaged during shipment and that all components and parts are present according to the packing list.

A standard scope of supply for an AP11 system will include:

- Control unit with standard installation accessories and 7 m (23') of cable.
- J3000X or J300X (optional) Junction Unit.
- RFC35 Fluxgate Compass with 15 m (49') cable attached.
- RF300 Feedback unit with 10 m (33') cable attached and transmission rod.
- Appropriate drive unit for the installation (unless the AP11 is going to operate an existing drive unit)
- Optional equipment that may have been ordered for the installation.

3.4 Determine system configuration

It is important to become familiar with the configuration of the system prior to beginning the installation. The diagrams presented on page 42 through page 44 provide sample system configuration drawings.

With the flexibility of the AP11 system, your specific installation may include all or part of one of the sample diagrams.

Try to mount the units within the standard cable length supplied with each unit.

AP11 Basic system

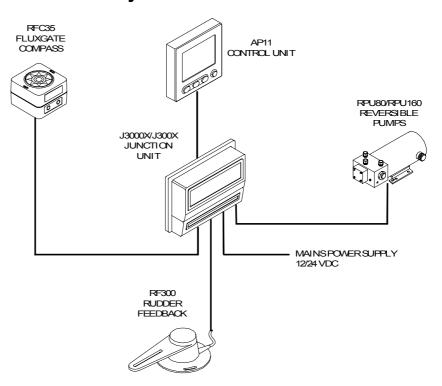


Figure 12 AP11 Basic System

RFC35 FLUXGATE COMPASS J3000X JUNCTION UNIT RPU80 REVERSIBLE PUMP SPEED DATABOX RF300 RUDDER FEEDBACK

AP11 connected to a IS11 instrument system

Figure 13 AP3000X connected to an IS11 system

AP11 system with options

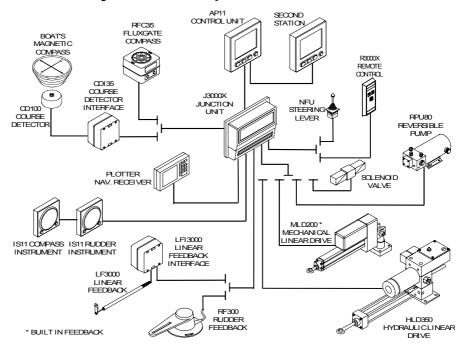


Figure 14 AP11 system with options

RFC35 FLUXGATE AP11 CONTROL UNIT PLOTTER J300X JUNCTION EXTERNAL ALARM CLOCK DATA OUTPUT CHART PLOTTER IS11 RUDDER INSTRUMENT IS11 COMPASS INSTRUMEN HYDRAULIC LINEAR DATABOX SPEE RF300 DEPTH RUDDER FEEDBACK IS11 INSTRUMENTS IS11 SENSORS

AP11 system with special J300X options

Figure 15 AP11 system with special J300X options

3.5 RF300 Rudder feedback installation

The RF300 Rudder feedback unit mounts close to the rudders, and is mechanically linked to the rudder tiller arm or rudder quadrant.

Refer to figure below for the recommended mounting arrangement. Note that the RF300 transmitter arm has two slots for the transmission link. The slots enable maximum flexibility to provide the 1:1 mechanical linkage relationship.

Do not try to remove the transmitter arm from the feedback unit. The unit is factory adjusted and need no further adjustment at installation than described below.

As a starting point, it is desirable to set the transmitter rod to the inner limit of the outer slot if possible. (Refer to figure). Drill and tap the rudder tiller arm so that the Y1 dimension is equal to the Y2 dimension (Use 4.2 mm drill and 5 mm tap). Attach the ball joint to the tiller arm, and connect the transmitter rod to the ball joint at the rudder tiller arm.

Note!

Turn the helm wheel to set the rudder tiller arm to approximate center position.

Rotate the RF300 transmitter lever until it is also set to center position. (A simple method is to line up the transmitter lever to be opposite the cable entry into the feedback.)

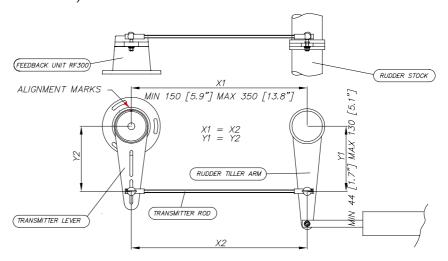


Figure 16 RF300 mounting

Attach the transmitter rod to the RF300. Set the RF300 mounting location to be in accordance with the figure above. The center of the RF300 should be in line with the center of the rudder post. Mount the RF300 to a suitable platform using the screws provided. If necessary, add blocking material under the RF300 to adjust the height of the transmission arm to be level with the rudder tiller arm.

Due to space limitations, it may be necessary to cut the length of the transmitter rod to move the RF300 closer to the rudder post.

Tighten the mounting screws for both the RF300 feedback unit and the transmitter rod ball joint.

Have someone observe the RF300 while someone else turns the helm wheel through the complete range of travel from full port to full stbd. rudder to verify that the mechanical linkage to the RF300 is not obstructed.

Note!

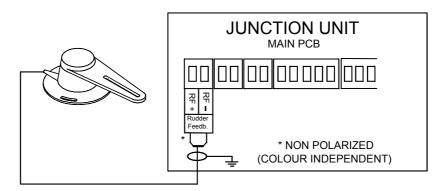


Figure 17 RF300 connection

3.6 Junction unit installation

The J300X and J3000X junction units are not weatherproof and should be mounted in a dry place between the control unit and the drive unit. The junction unit is designed to operate in a location that provides ambient temperatures below $+55^{\circ}$ C ($+130^{\circ}$ F).

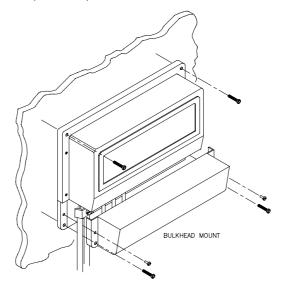


Figure 18 Junction unit - Bulkhead mounting

Cable connections

Use only shielded cables. This includes Mains input, drive units and if necessary for the extension of the RF300 Rudder Feedback cable. The clutch/bypass cable and the solenoid cable should be 1,5 mm² (AWG14). Signal cables should be 0.5 mm² (AWG20) twisted pairs.

The mains supply cable and the drive unit motor cable should have sufficient wire gauge. This will minimize voltage drop and allow the drive unit to operate at full power.

Refer to the table below for recommended cable sizes.

Cable length	Drive Unit Voltage				
1. Distribution Board to Junction Unit.	12V		24V		
2. Junction Unit to Drive Unit motor. (Length refers to each of the two cables)	AWG	mm ²	AWG	mm²	
Up to 3 m (10 ft.)	12	2,5	12	2,5	
Up to 6 m ((20 ft.)	10	4	12	2,5	
Up to 10 m (32 ft.)	8	6	10	4	
Up to 16 m (52 ft.)	6	10	8	6	

Grounding and RFI

The AP11 system has very good RFI protection and all units are using the Junction Unit as common ground/shield connection. The Junction Unit should therefore have a proper ground connection to the hull.

ROBNET cables and other signal cables (compass, feedback, NMEA) should not be run in parallel with cables carrying RF or high current, such as VHF and SSB transmitters, battery chargers/generators and winches.

Remove the bottom cover to get access to the plug-in terminals. Strip about 1 cm (0.4") of the cable's insulation and pull the screen backwards to cover the insulation. Position the straps as shown and tighten well to make sure the screen has good contact.

Leave sufficient free wires so that the plug-in terminals can be easily connected/disconnected.

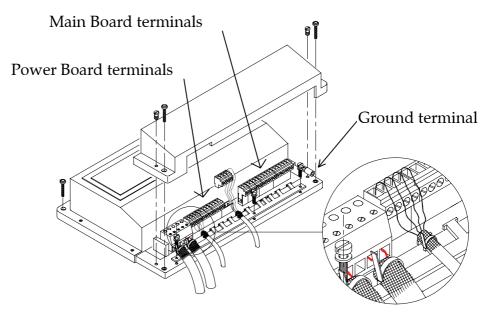
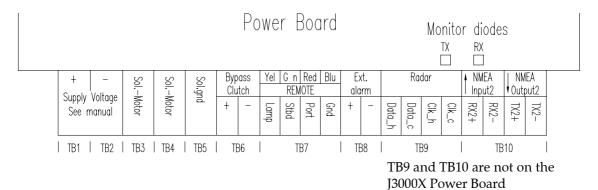
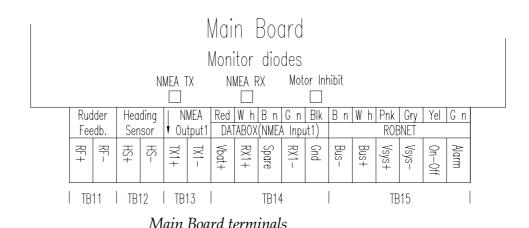


Figure 19 Junction unit grounding

Pull out each terminal before connecting the wires. Remove all strands before putting on the terminal cover.



Power Board terminals



3.7 Drive unit installation

The relation between drive units, drive unit voltage, input voltage, drive output and interfacing to steering gear are shown in the table below. The AP11 system detects whether a reversible motor or a solenoid is connected and outputs the correct drive signal automatically.

Refer to the connecting diagram for the different drive units on page 51 onwards.

Installation instruction for the drive units are found in the manual for the individual units.

Robertson Drive Unit type	Drive unit voltage	Input voltage (Mains)	Drive output	Interface to steer-ing gear
RPU80, RPU100 RPU150 RPU160 (Reversible hydraulic pump)	12V	12, 24V	Revers. motor	Hydraulic plumbing
RPU200, (Reversible hydraulic pump)	24V	24V	Revers. motor	Hydraulic plumbing
HLD350, HLD2000/HLD2000L HLD2000D (Hydraulic linear drives) MLD200 (Mechanical linear drive)	12V 12V 24V 12V	12, 24V 12, 24V 24V 12, 24V	Revers. motor	Direct mechanical connection to rudder quadrant
MRD100 (Reversible mechanical drive)	12V 24V	12, 24V 24V	Revers. motor	Chain/ sprockets
MRD150	12V	12, 24V	Revers. motor	Chain/ sprockets
RPU1/RPU3 (Continuous running hydraulic pump)	12V 24V	12V 24V	Solenoids	Hydraulic plumbing

Note!

When selecting **DRIVE UNIT** voltage in the Installation setup, the clutch/bypass voltage is always set equal to the motor voltage. If a retrofit installation where e.g. a HLD2000 has a 12V motor and a 24V bypass valve, the bypass valve solenoid has to be changed back to standard 12V version. The drive unit output, terminals A-B, is a "bipolar" output which means you do not have to think about port and starboard. Also the clutch/by-pass connection is independent of polarity.

The maximum drive current capabilities of the J3000X and J300X junction units are different. Use the table below as reference.

HYDRAULIC PUMPS

			RAM CAPACITY				
MODEL	MOTOR VOLTS	JUNCTION UNIT	MIN cm³ (cu. in.)	MAX cm³ (cu. in.)	FLOW RATE AT 10 bar cm³/min (cu. in/min)	MAX PRESSURE bar	PWR. CONSUM- PTION
RPU80	12V	J3000X	80 (4,9)	250 (15,2)	800 (49)	50	2,5-6 A
RPU160	12V	J300X	160 (9,8)	550 (33,5)	1600 (98)	60	3-10 A

Steering gear interface: Hydraulic plumbing

LINEAR DRIVE UNITS

MODEL	MOTOR VOLTS	JUNC- TION UNIT	MAX STROKE mm (in.)	PEAK THRUST kg (lb.)	MAX RUDDER TORQUE Nm (lb.in.)	HARD- OVER TIME sec. (30% load)	PWR. CON- SUMP.	TILLER ARM mm (in.)
MLD200	12V	J3000X	300 (11,8)	200 (440)	490 (4350)	15	1,5-6 A	263 (10,4)
HLD350	12V	J3000X	200 (7,9)	350 (770)	610 (5400)	12	2,5-8 A	175 (6,9)
HLD2000L	12V	J300X	340 (13,4)	500 (1100)	1460 (12850)	19	3-10 A	298 (11,7)

Steering gear interface: Connects to quadrant or tiller.

- 1. The motor voltage is stepped down by the junction unit when operating from 24V or 32V mains.
- 2. The specified junction unit is necessary to achieve max drive unit capacity.
- 3. Recommended operational thrust or torque is 70% of listed value.
- 4. Typical average power consumption is 40% of listed maximum value.

50

Connecting a reversible pump

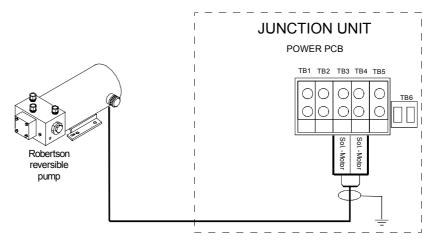


Figure 20 Reversible pump connection

Connecting a hydraulic linear drive

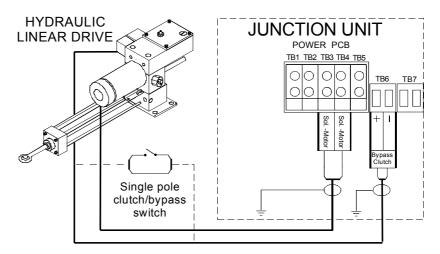


Figure 21 Hydraulic linear drive connection

Separate clutch/bypass switch

On sailboats it may be practical to install a single (or double) pole switch at the helm to be able to disengage the drive unit. Run the clutch/bypass cable via the switch to the junction unit as shown. Refer also to page 27.

Connecting a solenoid valve

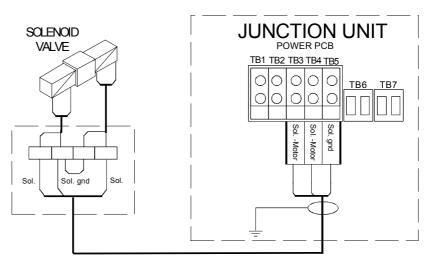


Figure 22 Solenoid valve connection

3.8 Control Unit Installation

The control unit is fully waterproof and can therefore be installed on deck or below. The connections should be protected from water penetration and should, if possible, allow rear access to remove the desiccant pack annually.

The position selected should in the first instance meet the requirements of the helmsman or crew. The control unit should be at least 150 mm (6") away from a magnetic compass.

Pay particular attention to the viewing angle when installing the control unit in a dashboard or overhead. A viewing angle of min. 30° is recommended. When reading the display from the opposite position (12 o'clock) the viewing angle can be reduced to 20°.

The selected surface must be flat and even to within 0.5 mm.

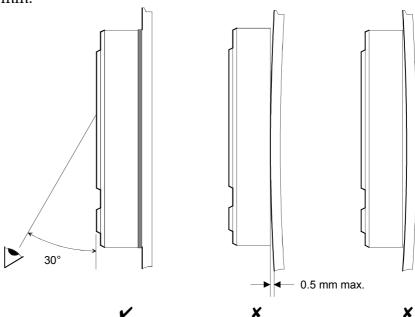


Figure 23 Control unit mounting

- 1. Once a suitable position has been found, the installation can begin. For security reasons a note should be made of the unit serial number, and kept in a safe place.
- 2. Carefully position the self-adhesive template provided on the surface where the instrument is to be mounted
- 3. Drill a small pilot hole first and then check the location on the other side of the panel or bulkhead to confirm suitability.

Note!

- 4. Open hole out using a 50 mm (2") cutter in a hand held brace or electric drill. Drill the 4 fixing holes using a 2.5 mm (3/32") drill.
- 5. Connect the control unit to the Dataline wire, making sure that the colors are correctly wired to the terminals. Note that the cables should be supported with clips close to the terminal blocks.
- 6. Before finally fixing the instrument in position, the installation should be checked functionally.
- 7. If it is not possible to gain access to the instrument back when fitted, the terminals at this stage should be covered with a liberal coating of silicone grease, Vaseline, WD40 (or similar moisture dispersant). These materials will not harm any other instrument components.
- 8. Secure the instrument head in place using 4 No. 6 self tapping screws provided and ensure the sealing gasket is correctly located with the self-adhesive side to the location surface. DO NOT OVERTIGHTEN as the instrument can be permanently damaged if distorted tighten screws lightly and evenly.

Note!

DO NOT use any form of sealing compound on the instrument back. This can damage the instrument and prevent access to the desiccant pack.

9. Finally, the cover can be clipped over the instrument.

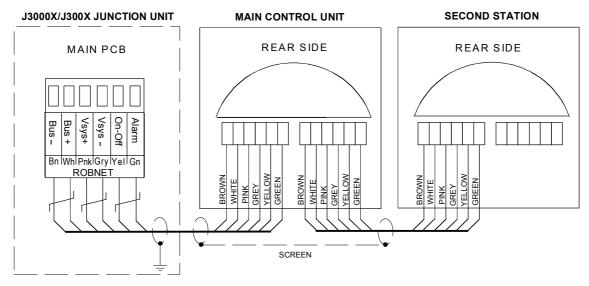


Figure 24 Control unit connection

Note!

It is important that the two screens are connected in a dual station configuration. Strip off sufficient amount of insulation on both cables, unbraid the screens and "crimp" them together or use a separate screw terminal.

3.9 RFC35 Fluxgate Compass installation

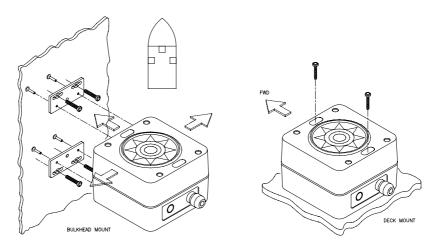


Figure 25 RFC35 mounting

The heading sensor is the most important part of the AP11 system and great care should be taken when deciding the mounting location. As the heading is displayed on the AP11 Control Unit, the heading sensor can be mounted at a remote location.

Note!

An autopilot fluxgate compass or magnetic compass should not be installed on the fly bridge or in the mast.

The RFC35 compass can be mounted on deck or bulkhead, athwartship or alongship. The heading offset feature in the AP11 will compensate for the mechanical offsets that may be a result of the selected location and orientation of the RFC35.

If the RFC35 is deck or bulkhead mounted athwartship with the cable gland pointing aft, little if any offset correction is required. With the cable gland pointing forward a 180° correction is required.

When mounting RFC35 on a bulkhead alongship, a +90° or -90° correction is needed dependent on whether it is a port or starboard bulkhead.

Note!

Offset correction is performed after the calibration (see page 78).

Find a location that provides a solid mounting place free from vibration, and as close to the vessel's center of roll and pitch as possible, i.e. close to the water line. It should be as far as possible from disturbing magnetic influences such as the engines (min. 2 meters), engine ignition cables, other large metal objects and particularly the drive unit.

Use the supplied mounting kit and drill the holes through the center of the slots in the sensor or the mounting brackets.

The compass faceplate on the RFC35 is the TOP. Never mount it upside down! Level the sensor as close to horizontal as possible.

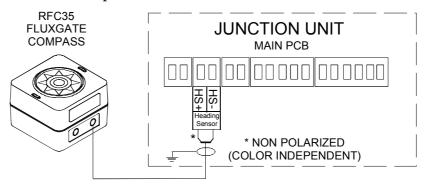


Figure 26 RFC35 connection

3.10 RFC35R Rate Compass

The RFC35R Rate Compass also contains a magnetic fluxgate sensor, which means you have to take the same precautions at installation as for the standard RFC35 (see previous page).

- Cut the Robnet connector from the cable using spare terminal in the accessories kit.
- Connect to Control unit according to drawing below.
 Note that the yellow and green wire shall not be connected.

(Alternatively the RFC35R can be connected to the junction unit).

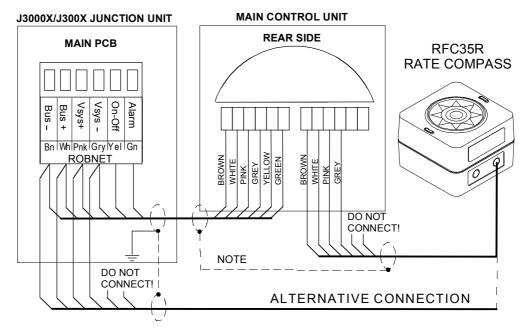


Figure 27 RFC35R Rate Compass connection

Note!

Refer to page 55; screen connection.

- Select "net" in the Dockside menu. Refer to page 70
- Perform the compass calibration as described on page 78.

Note!

After turn on the compass will stabilize in less than 30 seconds, but it will need another 10 minutes to get the full effect of the rate sensor.

Refer to page 78 to compensate for any permanent off-set after the calibration is completed.

RFC35R calibration data is stored in the compass and will not be deleted by a Master Reset in the autopilot. Offset corrections, however, must be reset.

3.11 R3000X Remote Control installation

R3000X should be mounted in the supplied bracket that can be fixed by four mounting screws. The unit is not waterproof and should be protected when mounted outdoor.

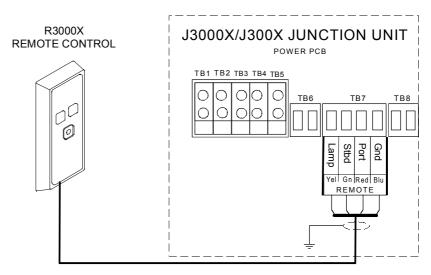


Figure 28 R3000X connection

3.12 S100 NFU Lever installation

The S100 Steering Lever is for indoor mounting in panels up to 8 mm (5/16") tick. The handle has to be removed from the unit before mounting. A 22 mm (7/8" hole should be cut in the panel. Be sure that the Robertson label is pointing forward to get correct direction of rudder movement (Port/Stbd.) when operating the steering lever. S100 is supplied with 2m (6,7") cable and plug. Cut the plug and connect the wires to the junction unit Power PCB as shown. An optional extension cable is available from Simrad Robertson. Alternatively a suitable cable and junction box or terminal should be provided locally.

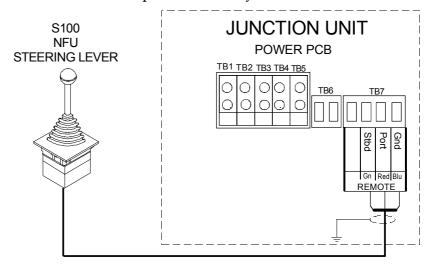


Figure 29 S100 connection

3.13 Interfacing

With the AP11 autopilot system there are several possibilities to connect to other equipment for data exchange.

A further interface expansion is to connect to the Robertson Databox to provide interface to IS11 sensors, Chart plotter and GPS Sensor.

The NMEA output may also drive IS11 RUDDER and COMPASS instruments directly.

The different connecting diagrams below illustrate the interface possibilities.

J3000X NMEA input/output

J3000X includes a single NMEA input/output port.

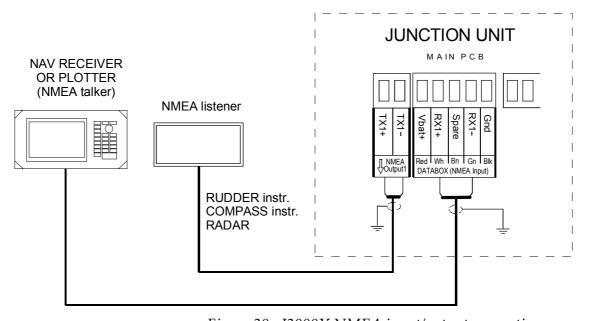


Figure 30 J3000X NMEA input/output connection

Databox connection

Note!

IS11 is the new instrument system from Simrad. It replaces the previous Dataline X system. Instructions in this manual referring to IS11 will mainly apply also for the previous Dataline X system.

The diagram is only showing the necessary connections to provide NMEA input (speed, wind, navigation) to the AP11, and NMEA heading output to the IS11 system. Other connecting diagrams for the IS11 system are shown in the separate IS11 manuals.

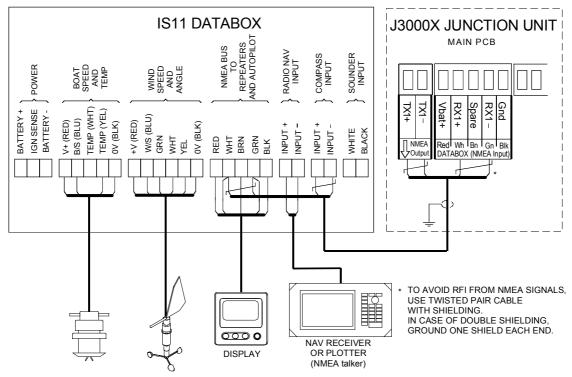


Figure 31 Databox connection

IS11 instrument installation

The IS11 Instruments (RUDDER, COMPASS) can be connected directly to the AP11 as shown. Both are designed for panel mount in exposed locations. See separate installation instruction enclosed with the units.

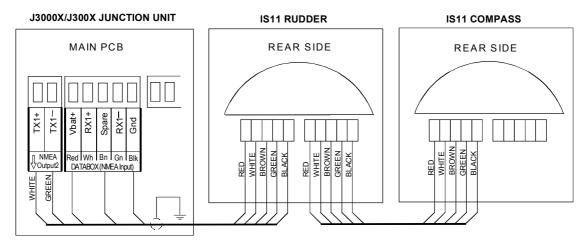


Figure 32 IS11 instrument connection

Note!

You can only connect the instruments as shown if the Mains input is 12V. If Mains input is 24V a separate 12V source must be provided for the instrument Vbat+ and Gnd input.

J300X/J300X-40 NMEA input/output

The J300X and J300X-40 Junction Unit has <u>two</u> NMEA input and output ports. The input ports are factory preset, dedicated ports that can not be altered. Hence, the connection of external Nav. receiver, Plotter and other NMEA "transmitters" must be made as follows:

Nav. receiver or Plotter to port 2 (RX2) on Power PCB.

IS11 Databox or Wind and Speed input from other source to port 1 (RX1) on Main PCB.

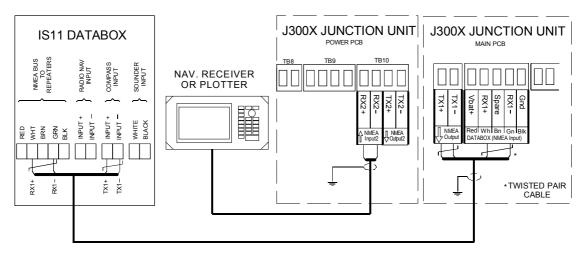


Figure 33 J300X/J300X-40 NMEA input/output connection

J300X Radar Clock/Data

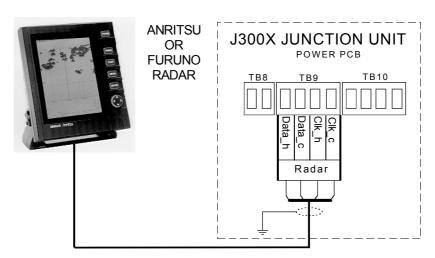


Figure 34 J300X Radar Clock/Data connection

J300X External Alarm

The external alarm circuit has an open collector output for an alarm relay or buzzer. The operating voltage for the circuit is the main supply voltage. Max. load on external alarm output is 0.9 Amp.

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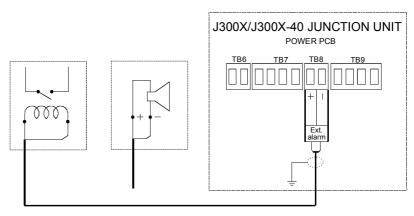


Figure 35 J300X External alarm connection

LF3000 Linear Feedback

Note!

The rod of the LF3000 is not locked in place in the cylinder. If caution is not exercised it may slip out of its housing and end up over the side, so be careful!

The LF3000 is a waterproof feedback unit. It has a 300 mm (11,8") stroke and comes with a special mounting bracket which secures the LF3000 to the cylinder of the existing outboard drive unit.

The 8,5 m (28') cable is terminated in the LFI3000 Mk2 Linear Feedback Interface according to the wiring diagram.

Center the drives. Loosely secure the LF3000 to the supplied mounting bracket, across the center of the drive unit cylinder. Either cylinder may be used if there is a dual set up. You may mount the feedback in either direction, i.e. the shaft of LF3000 may point to port or starboard.

Loosen the end bolt (a) used to secure the cylinder to the drive unit mount. Insert the rod retaining assembly (b) (end plate) and retighten this bolt. Secure the feedback rod to the end plate using the two washers and cap nut provided. Adjust the location of the LF3000 Linear Feedback to allow full travel of the hydraulic cylinder without causing the endplate of the LF3000 hitting the end of the cylinder. Check that the outboard motor can be tilted freely. Tighten all nuts and the mounting bracket.

Turn the helm slowly by hand to the stops on either side, making sure that the rod does not bind up in any direction. Also, clamp cable to allow full engine movement to port and starboard. The mounting hardware provided with this

system is meant to interface with Teleflex HC5340 cylinders and Hynautic K7 and K10 Cylinders. If you are attempting to interface to another system the hardware enclosed may not be appropriate!

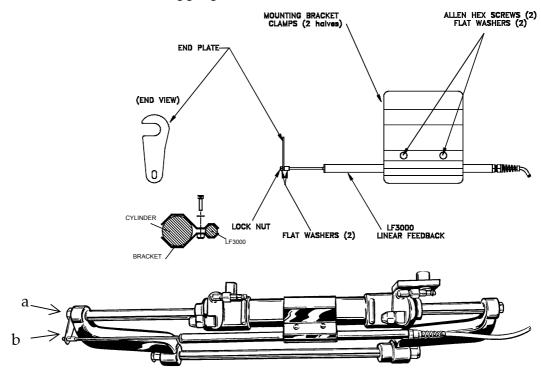


Figure 36 LF3000 mounting

Electrical connection

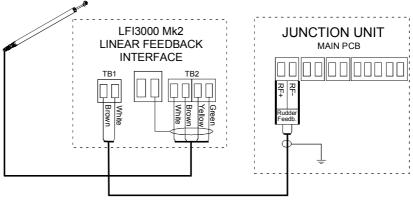
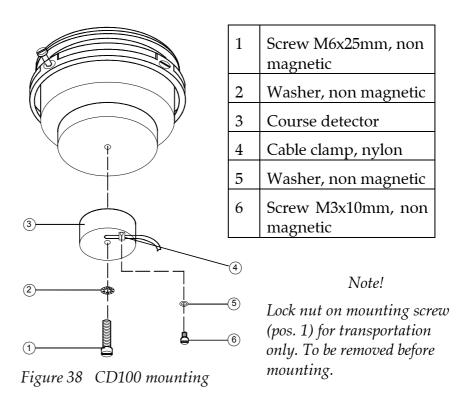


Figure 37 LF3000/LFI3000 Mk2 connection

Note! The previous LFI3000 had no centre block terminal for screen termination.

CD100 Course Detector

On some installations the owner may prefer to use the boats own compass. The compass must be fully gimbaled and have a flat surface underneath to fit the CD100. Make hole for a 6 mm screw in the bottom of the compass and mount the CD100 as shown on the drawing. Secure the 6 mm screw through the centre hole of the CD100. Make sure the cable does not prevent the compass from moving freely in the gimbals.



CDI35 Interface

Locate the CDI35 as close to the compass as possible so that there will be no problem finding it in the event of a service.

Put the two fixing screws in the slots and secure the unit to the bulkhead. Open the unit to access the screw terminals.

Cut the CD100 cable to make a suitable length and connect both cables as shown on the diagram below.

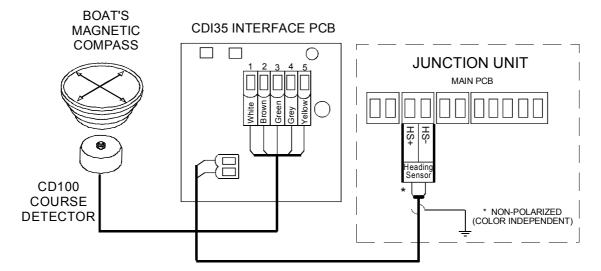


Figure 39 CD100/CDI35 connection

3.14 Software Setup Procedure

Description of Installation Settings

The design of the AP11 includes advanced features that have simplified the installation and setup of an autopilot. The principle advantage is that manual adjustments that needed to be done on previous models are no longer necessary with the AP11.

Note!

The installation settings must be performed as part of the installation of the AP11. Failure to correctly set the values in the installation settings may prohibit the AP11 from functioning properly!

The Installation Settings are grouped into the following functional categories:

• Dockside Settings: Sets values of items to be set

prior to sea trials

• Sea trial Settings: Determines automatic

calibrations and steering

parameters

View Parameters Permits viewing, setting or

changing of steering parameters

Each group is designed to focus on specific functions related to an installation activity.

Some important points regarding the installation settings values:

- When the AP11 is delivered new from the factory, (AND ANY TIME AFTER A MASTER RESET HAS BEEN PERFORMED) the Installation Settings are all reset to preset (default) values. The warning message INST REQ (Installation Setup Required) will appear at turn on and if an attempt is made to access the AUTO modes.
- The Dockside and Sea trial settings can only be accessed when the system is in STBY mode.
- The values that are selected (also referred to as "PARAMETERS") from within the Installation Settings Menu, are stored in the memory of the AP11 system by activating a dedicated push button.

- The Installation Settings are available to both control units in the system if there is a second station installed.
- The values in the Sea trial Settings are dependent on successful completion of the Dockside Settings.
- Before attempting to turn on the AP11 and perform an Installation Setup, the hardware installation and electrical installation must be completed in accordance with the installation instructions.

AP11 Installation menus

AP11 has five installation menus. Access to the menus is achieved by pressing the two arrowed buttons simultaneously.

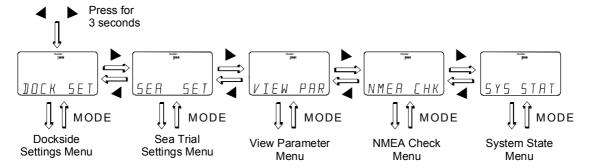


Figure 40 Installation menus

The Dock-side Settings Menu and Sea Trial Settings Menu are for installation setup. The View Parameter Menu is an information menu displaying the different steering parameter settings used for the boat. It is also used if you want to change any of the parameters.

The NMEA Check Menu and the System State Menu display system data and are useful when trouble shooting your system.

Operation of the different menus is based on the following principle of push button operation:

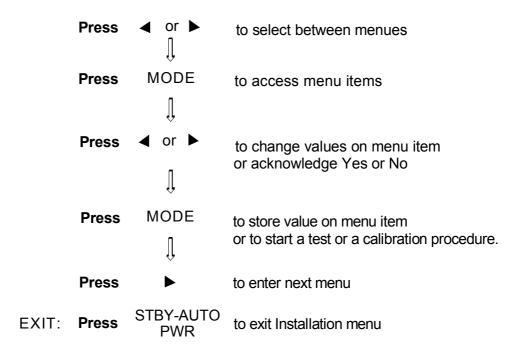


Figure 41 Menu operation principle

After the mechanical installation of the units it is necessary to go through the installation setup to configure the system to the boat and the steering system.

Before you start you should know the following: Type of boat (displacement, planing, sail), rudder angle at hardover position and at which transition speed you want the steering parameter to be changed from HI to LO.

The installation setup menu is divided into two parts, Dock-side settings and Sea Trial settings.

After having accessed the Dock-side Settings Menu, press MODE to enter the first menu item in this menu.

Use the flow chart on next page when you perform the settings in the Dock-side Settings Menu.

Dock-side settings Indicates a flashing display DOCK SET Mode COLOUR Mode Mode COLOURColour codes: W: white Select 12 V or 24 V by pressing ◀ or ▶ . Select planing, displacement or sail boat by pressing ◀ or ▶ G: green Store by pressing MODE Store by pressing MODE R: red Select colour by pressing ₄ or ▶ Store by pressing MODE Mode Mode Mode Use ► (Yes) or ◄ (No) to acknowledge MAX Move rudder h.o. port, Press MODE to Move rudder h.o. starboard. adjust to correct value start rudder test pressing ◀ or ▶ by pressing ∢ or ▶ . Store by pressing MODE Store by pressing MODE **,** RAIAR 5 P E E 1 RESET Mode Mode Mode Press Adknowledge YES by Select type of radar Select type of compass Change value by ◀ or ▶ pressing MODE by presssing ◀ or ▶ (F = Furuno, A = Anritzu) Store by pressing MODE (J3 - - = Fluxgate compass by pressing ◀ or ▶ or magnetic compass, net = RFC35R Rate compass) Store by pressing MODE Store by pressing MODE

Figure 42 Dock-side Settings Menu

Display illumination colour

Activate the COLOUR display by pushing MODE. Use the < or > button to select desired illumination colour. You may select between white (W), green (G) or red (R).

Store selected colour by pushing MODE.

Push > to proceed to next menu item.

Boat type

The display will read BOAT TYP. The selected type of boat will affect the steering parameters. Activate this menu item by pressing MODE. The selected boat type will flash on the display and can be altered by pressing < or >. You may select between dISP (displacement), PLAN (planing) and SAIL. Push MODE to store selected boat type. Push > to proceed to next menu item.

Drive unit voltage

The display will read DRIVE VOLT. This menu option requires the installer to set the drive unit voltage to the correct level. The selections are 12V or 24V and should be set to the voltage specified for your drive unit.

Selection of improper voltage level for your drive unit may damage both the drive unit and junction unit even if the protection circuits in the junction unit are activated.

Refer to the drive unit table on page 49 for information. It is not possible to select a higher voltage than the input voltage. The CLUTCH/BYPASS voltage is automatically set to the same as the drive unit voltage. The AP11 will also automatically detect whether the drive unit is a reversible motor or solenoid operated.

Activate the DRIVE VOLT display by pushing MODE. The display will start flashing. Use the < or > buttons to select 12 or 24 V drive unit voltage.

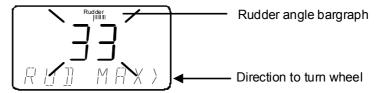
Store selected voltage by pressing MODE.

Push > to proceed to next menu item.

Note!

Rudder feedback calibration

The display will read RUD MAX >. This function enables you to compensate for any non-linearity in the mechanical transmission between rudder and rudder feedback unit. Press MODE to activate the rudder calibration procedure. The display will start flashing. Turn the wheel hardover to stbd. (as indicated by the arrow) until the rudder stops at maximum starboard rudder.



The value shown on the display (example) is the rudder angle as read by the rudder feedback unit before any adjustment is made. The bargraph indicates the direction of the feedback signal. If the displayed angle is different from actual angle, set correct rudder angle by pressing < or >. Then push MODE to store the value.

If the rudder feedback is not mounted according to instructions on page 44 or mounted upside down, the bargraph will show opposite rudder angle. Adjust as explained above until the bargraph is shown on correct side and the correct angle is displayed.

Proceed to next menu item which is calibration of PORT rudder by pressing >.

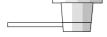
Repeat the above procedure with the rudder hard over to Port. (This time you need not correct for wrong side of bargraph readout). After having completed the rudder feedback calibration rudder zero may still be wrong but will be adjusted later during Sea Trial.

Push > to proceed to next menu item.

Rudder Test

The display will read RUD TEST. The rudder test will determine the direction of the rudder commands and adjust the rudder speed if a reversible drive unit is installed. If the system is connected to a solenoid operated steering gear the direction of rudder commands will be set and the adaptive rudder loop will compensate for rudder overshoot.

Note!



Note!

Move the rudder manually to midship position before starting the test. It is important also that if the boat uses power assist steering, that the engine or electric motor used to enable the power assist steering be turned on prior to this test. Stand CLEAR of the wheel and do not attempt to take manual control of the wheel during this test!

Activate the flashing display by pressing MODE. Acknowledge by pressing > (Yes) or < (No). Start the rudder test by pressing MODE. The display will be flashing ON and the AP11 will issue a series of PORT and STBD rudder commands to automatically verify correct motor direction, and reduce the rudder speed if it exceeds the maximum acceptable speed for autopilot operation.

When the test is finished the display will read dONE (SOL if connected to solenoid valves).

If the display reads SLO, the rudder speed is less than 1°/second and you must check your drive unit for improper operation or lack of power or capacity.

LFI3000 Mk2 additional test

- 1. Align engines to centre position; "zero rudder".
- 2. Rev engines to 3-4000 rev/min and observe the rudder angle indicator on the autopilot, a 2° change in the reading should be accepted.
- 3. If the rudder angle exceeds 2°, connect the screen on the TB1 cable to the centre block terminal (See Figure 37) and repeat item 2. If this gives a better result keep the screen connected.

After the above dock-side settings are completed, the autopilot can be operated in the normal way even if some adjustments remain before the installation setup is completed.

Proceed to next menu item by pressing >.

Note!

Compass setup

This menu item will set up the system to read compass heading on the Robertson two-wire format or on Robnet format. If a standard RFC35 Fluxgate compass or a magnetic compass (via CDI35 Interface) is connected, the display shall read "J3—". If a Robertson RFC35R Rate Compass is connected the display shall read "net" (Robnet). Activate the COMPASS display by pressing the MODE button. Use the < or > button to select the correct interface. Store by pressing the MODE button.

Press > to proceed to next menu item.

Radar

The display will read RADAR. If your AP11 system includes a J300X (not a J3000X) Junction Unit, you have the possibility of connecting a Anritsu or a Furuno radar that do not read heading signals on NMEA format. Activate the RADAR display by pressing MODE. Use the < or > button to select Anritsu (A) or Furuno (F) type of radar.

Store type of radar by pressing MODE.

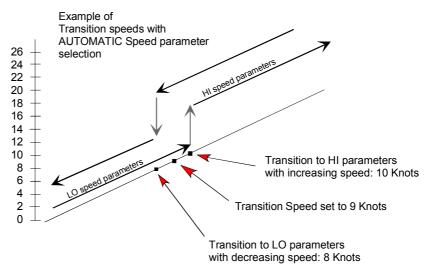
Press > to proceed to next menu item.

Transition speed

The display will read SPEED. The AP11 provides two different sets of steering parameters for controlling the response of the boat at different speeds (HI) or (LO) while in AUTO COM and AUTO NAV modes.

The AP11 always selects the HI speed steering parameters when first switched on. This is a safety feature. After initial turn on, selection of the steering parameters is done automatically, based on the availability of input data from either an external speed log or an external navigator through the NMEA input port. GPS speed over ground may also be used if a log is not installed. However, GPS may give unstable speed information causing unwanted change of parameters.

The speed at which the AP11 changes from HI to LO (or opposite) is determined by the "Transition Speed" value as set under this menu item.



Press MODE to activate the transition speed setting. The display will start flashing. Use < or > to set the speed value and store the value by pressing MODE. Push > to proceed to next menu item.

If automatic HI/LO parameter selection is not wanted, leave SPEED at zero.

Master Reset

Note!

A Master Reset is part of the final test at factory and will reset the memories to factory settings. Unless you need to clear all stored values during the installation setup procedure, you should not perform a Master Reset.

The RESET function is activated by pressing MODE. You then will have to select YES by pressing the > button and to acknowledge YES by pressing the MODE button.

During normal installation set-up, the RESET menu item is omitted by another push on the > button to proceed to the SEA SET menu display.

3.15 Sea Trial

The Sea-trial menu (SEA SET on display) can only be accessed if the Dockside Settings are done and confirmed.

In the Sea-trial menu the following tests and settings are made:

RUD ZERO

Rudder zero adjust (To tell the AP11 the precise amidships position of the rudder)

COMP CAL

Compass calibration (To automatically compensate for onboard magnetic deviation)

COMP ADJ

Compass Offset (To offset the final compass heading readout if necessary)

AUT TUNE

Automatic tuning (An optional method of determining the steering parameters)

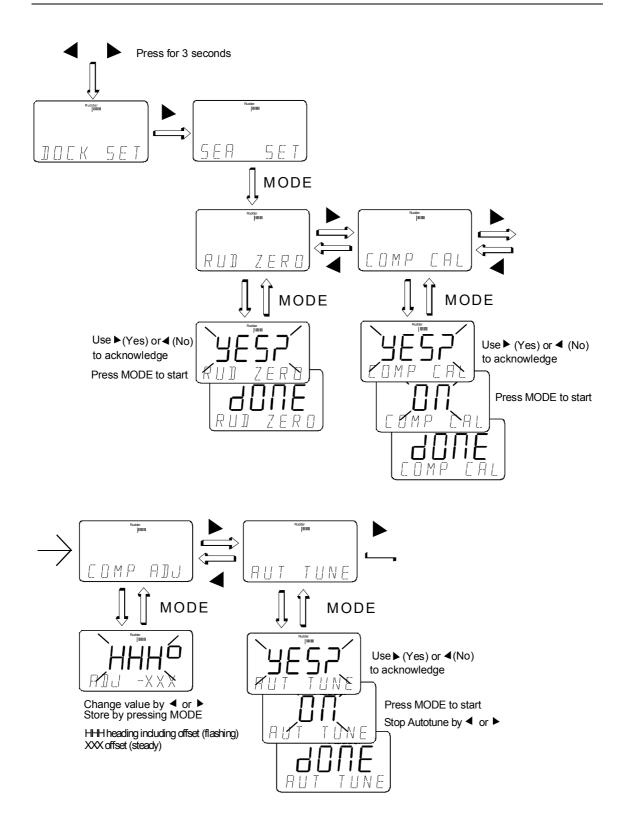
Enter the Installation Menu by pressing the < and > buttons simultaneously for 3 seconds. Proceed to the Sea Trial Menu by pressing the > button (See next page).

Rudder zero adjust

The display will read RUD ZERO. The adjustment should be made in calm sea and side forces from wind or current should be avoided.

- Bring the boat up to cruising speed, and head directly into the wind.
- If the boat has twin engines, synchronize the engine Rpm's.
- Set the trim tabs and stabilizers to have no effect on the boats heading.
- Steer the boat manually on a steady course.
- Press MODE to activate the rudder zero adjust, the display will flash YES or NO.
- If the display reads NO, press > to acknowledge YES.
- Press MODE again and the display will read dONE when the adjustment is completed.

Push > to proceed to next menu item.



Regain manual steering at any time by a short press on the STBY-AUTO button.

Compass calibration

The display will read COMP CAL. This function will activate the AP11 compass calibration procedure. The procedure will enable the compass to be automatically corrected for magnetic deviation on the boat that would alter the heading readout from the AP11 autopilot.

Before you begin the compass calibration procedure, make sure you have enough open water around you to make a full clockwise or anti clockwise turn with the boat. Let the boat turn at idle. You need $1^{1}/_{4}$ turn to complete.

The calibration should be done in calm sea conditions and with minimal wind to obtain good results.

- Begin turning the boat.
- Press the MODE button to activate, the display will flash YES or NO.
- If the display reads NO, press > to acknowledge YES.
- Press MODE again.
- When the calibration is completed, (after having made approximately 1 1/4 turns), it will be confirmed in the display by showing dONE.

If the compass is close to disturbing magnetic objects, the compass calibration may fail, and the display will show "FAIL"

In that case move the compass to a better location and re-calibrate.

After calibration, check the compass readout against a known reference, other compass or leading line. If the reading is correct (+/-3°) except for a fixed offset, use the COMPASS OFFSET setting to input a fixed correction to offset the heading readout.

Push > to proceed to next menu item.

Compass Offset

The display will read COMP ADJ. This feature allows you to correct for a constant compass heading offset that may be present as a result of the RFC35 being installed with the lubber line offset or a fixed offset remains after the calibration procedure has been completed. The COMP ADJ

will also compensate for offsets if there is a CD100/CDI35 connected to the boats own compass instead of an RFC35.

Activate the COMP ADJ feature by pushing MODE once. Adjust the heading readout to agree with the known, accurate heading by pushing < or >. The offset value can be either positive or negative. Store value by pushing MODE. The adjusted heading is flashing on the display, while the offset value is shown on the bottom line.

Note!

The offset required may be as big as 90 degrees, caused by the orientation of the compass when installed. If an offset still exists after having accounted for the mechanical offset, one of the following problems may still exist:

- The heading reference that you are comparing with the compass is not accurate.
- The automatic calibration is not correct, and may be due to a large magnetic influence near compass. (A relocation may be needed.)

Push > to proceed to next menu item.

Automatic tuning

The display will read AUT TUNE. Autotuning is a new dynamic function that enables the AP11 system to automatically set up the steering parameters (Rudder, Counter Rudder, Autotrim) for the boat. The scaling factors of the parameters are also set automatically as a function of the boat type selection performed in the Dockside Settings Menu.

Note!

Autotune is an optional procedure that is not required for the AP11 to function. The AP11 is preset with steering parameters that should steer most boats in the 30 - 50 foot range and Autotune may not be required if the preset parameters steer your boat acceptably.

Recommended speed during Autotune is 5-10 knots. Autotune should not be performed at planing speed. It is recommended that the Autotune be done in an East or West direction if possible, as these will yield the best balanced parameters.

WARNING!

The Autotune function will take control of the boat and perform a number of S-turns. It must always be performed in open waters with sufficient safe distance to other traffic. The Autotune function may take from 1 to 2 minutes to complete.

- Activate the AUT TUNE by pushing MODE, the display will flash YES or NO.
- If the display reads NO, press > to acknowledge YES.
- Press MODE again to start the Autotune.
- After the Autotune is completed the display will read dONE. The rudder must be controlled manually as the mode is returned to STBY.

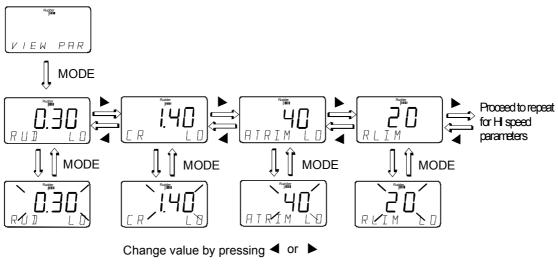
After having performed the Autotune, there should normally be no need for further adjustments. On certain installations, however, you may want to "fine tune" the parameters after the Autotune due to the special steering characteristic of a specific boat. Viewing or changing the Autotune parameters are done from within the VIEW PARAMETERS menu item.

View parameters

A boat's steering parameters found by Autotune can be looked at and if needed changed under this menu item. The steering parameters can also be set to values manually instead of performing an Autotune. The parameters are divided into two sets:

- HI = Steering parameters for automatic steering at HI speed
- LO = Steering parameters for automatic steering at LO speed

Access the View Parameter Menu as described on page 68. Press the MODE button to access the first menu item. Study the flow chart and table below for further information and follow the recommendations on the next page.



Store value by pressing MODE

	DISPLACE- MENT		PLANING		SAIL		OWN BOAT	
	LO	HI	LO	HI	LO	HI	LO	HI
RUDDER	0.50	0.35	0.30	0.20	0.50	0.35		
C. RUDDER	1.40	1.00	1.40	1.00	1.40	1.00		
AUTOTRIM	40	40	40	40	40	40		
RUDDER LIMIT	20	20	20	20	20	20		

Note!

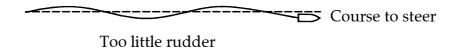
The values in the table are factory set and listed for information only. After having performed the Autotune, the values are most probably different from those listed in the table. It is recommended that you write down the parameters "learned" by the Autotune prior to making any adjustments.

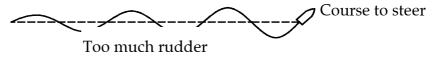
The View Parameter menu can also be displayed in AUTO modes. It is then possible to adjust the parameters while the autopilot is on automatic steering and the result can be observed instantaneously.

The two most important parameters that determine the performance of the automatic steering are Rudder and Counter Rudder.

Rudder sets the rudder gain which is the ratio between the commanded angle and the heading error (P-factor).

Too little Rudder and the autopilot fails to keep a steady



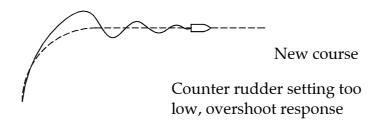


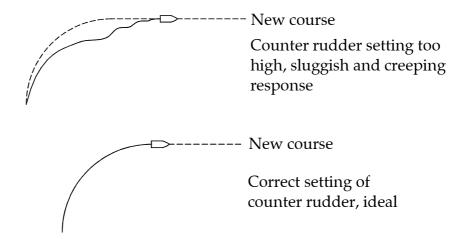
course.

- Too much Rudder gives unstable steering and reduces speed.
- Low speed requires more rudder than high speed.

Counter Rudder is the parameter that counteracts the effect of the boats turn rate and inertia. For a short time period it is superimposed on the normal rudder response as provided by the Rudder parameter. It may sometimes appear as if it tends to make the rudder move to the wrong side (counter rudder).

The best way of checking the value of the Counter Rudder setting is when making turns. The figures illustrates the effects off various Counter Rudder settings .





Autotrim standard value is 40 which should work well on most boats. On sailboats it may be preferable to set Autotrim to zero, to avoid unwanted rudder offset when changing course

Rudder Limit should be kept at 20 degrees unless there is a need for more rudder when performing dockside maneuvers.

In no event should the Rudder Limit be set to a value higher than the actual maximum rudder angle.

Final sea trial

- □ After having completed all settings in the Installation Menu, take the boat out and perform a final sea trial in open waters with sufficient distance to other traffic.
- □ Steer the boat on all cardinal headings in AUTO COMPASS mode.
- □ Start with low and medium speeds to get familiar with the response from the AP11.
- □ Try the effect of LO and HI speed settings manually.
- □ If the hardware for automatic HI/LO speed selection is connected and configured, verify that the HI/LO transition is occurring, and the HI/LO parameters are changing after the transition speed is crossed (by more than 1 Knot higher or lower speed).
- □ Try the Dodge function and the U-turn.

Note!

- □ If a Non-Follow Up lever (or hand-held remote) is connected, test the mode switching and verify Port and Stbd steering commands of the lever.
- ☐ If the installation is on a sailboat, try the specific sailboat functions using the owner as a consultant on the boats specific steering characteristics when sailing. Be careful to avoid hazardous situations until you gain experience.
- Set waypoints into the navigator connected to the system, and verify that the AP11 steers in AUTO NAV mode.
- □ Provide the owner with user training.

Providing user training

The user should be instructed in the "basic" operational functions, such as:

- □ Turning the system on and off
- □ Explain how to change modes (explain briefly what takes place in the different modes).
- Regaining manual control from any mode. Point out in what modes the helm is engaged by the autopilot (bypass/clutch).
- Review how to use a NFU lever and remote controller if connected.
- □ Course change in 1° and 10° (TURN) increments.
- □ Go through the user adjustable settings and show how to (and why) change the settings.
- □ Show the owner where the compass is mounted and instruct him to keep magnetic items away.
- □ Show where the Mains circuit breaker is.

4 MAINTENANCE

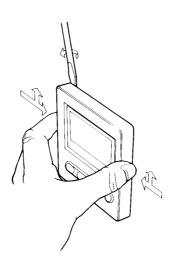
4.1 Control unit

The AP11 Control Unit will under normal use require little maintenance as the cases are made from high impact material (polycarbonate) to withstand the rigours of an exposed cockpit. It is important to avoid using chemical cleaners and hydrocarbons such as diesel, petrol etc.

If the instrument requires any form of cleaning, use fresh water and a mild soap solution (not a detergent).

It is advisable at the start of each season to check all connections to the control unit head and cover with silicone grease, Vaseline or WD40. The desiccant pack at the rear of the instrument above the terminal block should be removed and dried if signs of condensation appear on the instrument glass. This can be achieved by partially removing the M3 screw and pulling on the screw. The pack can then be dried by placing in a warm place for 24 hours. Do not use gas oven for this purpose.

Removal of the Control Unit



To remove the control unit, the outer cover must first be removed. This can be done by squeezing the sides between finger and thumb and applying an upward pressure. At the same time place a wide bladed screwdriver between the bulkhead or panel and the cover, and gently rotate.

Then remove the four fixing screws securing the head in place, and very gently lever off the head.

4.2 Junction Unit

No special maintenance is required. It is advisable, however, at the start of each season to make a visual inspection of the internal and check all connections.

4.3 Rudder Feedback

Make a visual inspection at 2-3 month intervals and at the start of each season. Apply some grease at the ball joints when required (RF300).

At the start of each season also make a visual inspection of the (LFI3000) feedback interface if installed, and check the connections.

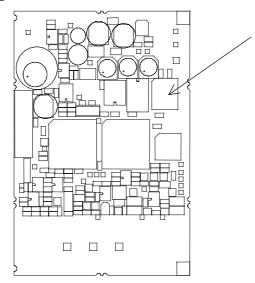
4.4 Compass

If the compass is exposed to the weather, make a visual inspection at 2-3 months intervals, and at the start of each season.

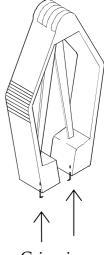
4.5 Drive unit

Refer to the drive unit manual for maintenance instructions.

4.6 Exchange of E-Prom



Junction Unit EPROM



- Remove the EPROM from the socket by means of the special extraction tool (P/N 44139806)
- Insert the tool by pressing the two grip pins down into the two slots in the corners of the socket.
- Squeeze the tool and pull out the EPROM.
- When inserting new EPROMS, make sure the cut-off corner matches with the one in the socket. Press it gently into the socket.
- The identification tag indicates:
 - Name of unit
 - Robertson part number
 - Software version

EPROM for J300X and J3000X Junction units:

- P/N 22081640
- After change of EPROM, perform a master reset as described on page 75.

Grip pins

Identification
Cut-off tag
corner

Slots

5 TROUBLE SHOOTING

An autopilot is a complex system and the performance is dependent of a proper installation and a successful sea trial.

In the event of a failure, you will be helped by the AP11 software which contains several test features that will assist you in isolating a probable fault.

5.1 Alarm listing

Display	Probable fault	Recommended action
OFF CRS.	Off course alarm Limits: ±20° on compass, ±5° on wind	Check steering parameters (View Parameters Menu page 80). Check boat trim, adjust trim flaps or sails.
COMPASS	Compass failure	Check connections, cable and heading sensor.
RUDD.ANG	Rudder feedback failure	Check cable, connections and installation of Rudder Feedback Unit
ACTUATOR	Drive unit failure	Check connections to drive unit motor and clutch or bypass valve. Verify that motor is running, and the clutch or bypass clicks in and out. Also check that the mechanical or hydraulic hand steering works properly and that the rudder moves smoothly. Consult the drive unit manual.
NO DATA	Navigation or Wind data missing. Indicates that no data is received from Nav. receiver or windvane system	Check that the "NMEA talker" is powered up and configured for transmitting data to the autopilot. The LEDs in the junction unit will flicker if data is present on RX port. Check connections, cables and switches on data source.
NAV.DATA	Sentence with required Nav. info is missing	Run NMEA check in installation setup to analyze incoming data. Also check Nav. receiver setup for: waypoints, route, magnetic variation, arrival alarm etc.

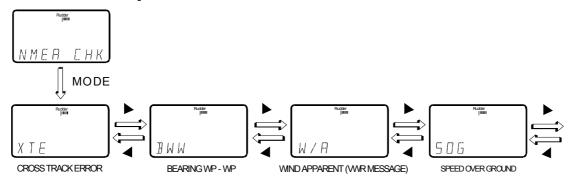
NAV.FORM	Wrong sentence format on nav. data	Check the nav. receiver
NAV.INV.	Sentence have "info invalid" flag set	Check the nav. receiver
W/A. DATA	Sentence with required Wind info is missing	Check wind vane and wind data computer/transmitter
W/A.FORM	Wrong sentence format on wind data.	Check wind vane and wind data computer/transmitter
W/A.INV.	Sentence have "info invalid" flag set.	Check wind vane and wind data computer/transmitter
J.DATA	No data is being stored in the junction unit memory	Use the View Parameter Menu in the installation setup, and verify that the setup for your boat is stored. Try to make changes on Rudder and Counter Rudder values. Exit menu before switching off. Switch on after one minute and verify that the parameters are retained. - Change Main PCB in junction unit if not successful.
CTRL.UNIT	No communication with control unit	Check cables and connections between units Change Control Unit if not successful.
DATACOMM	No communication with junction unit	Check cables and connections between units. Change Main PCB in junction unit if not successful.
MAIN CUR.	Mains current too high	Check that the drive unit is operating and not seized. Check cables and junction boxes for short circuit.
LOW VOLT	Mains voltage less than 9 volts.	Check battery voltage and connections to junction unit. Switch off and charge batteries if necessary.
OVERVOLT	Mains voltage above 29 volts.	Check alternator/generator and battery connections.
INT 15V	Internal regulated voltage too low or missing	Replace Main PCB in Junction Unit

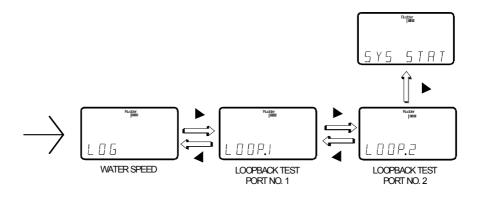
CLTCH.OVL.	Clutch circuit overload (current >> 2A)	Check clutch or bypass coil for possible short circuit. Also check cable for short circuit.
UNIT TEMP.	Excessive temperature in Junction unit (>>75°C), possible long term overload.	 Switch off autopilot Check for backload in Drive unit/steering system. Check that Junction unit specifications matches Drive unit.
W/A SHIFT	Wind shift exceeding 15°, causing heading reference change of same magnitude.	Automatic reset when within limit.

5.2 NMEA interface check

The NMEA interface check is a more detailed analysis of the incoming NMEA data used in the AP11. Access the Installation Menu by pressing the < and > buttons simultaneously and proceed to the NMEA CHK display by pushing the > button. Enter the first menu item by pressing MODE and toggle between each menu item by pressing the < or > button, as shown on the flow chart below.

5.3 Data input check





Each menu item will show one of the following status codes:

--- NO DATA

OK Valid data received

INV Invalid data received

FRM Format failure, or wrong check sum received

If any of the displayed status codes are different from OK, the most probable reason is erratic or missing data from the data source, i.e. Nav. receiver, plotter, wind sensor or log. Check the individual equipment for correct set-up prior to consulting your Simrad Robertson dealer for assistance.

5.4 Hardware check

To confirm that the NMEA hardware of the Junction Unit is O.K., it is possible to make a loop-back test. Connect TX1+ to RX1+ and TX1- to RX1- for port no. 1 (J3000X) and similar for port no. 2 (J300X).

The display will give the message "OK" if hardware is O.K. and "--" if something wrong.

If a Dataline Databox is connected to one of the ports, it will automatically do a loopback test without any hardwiring.

5.5 Signal monitor

On the Junction unit input it is possible to monitor the incoming signal by observing corresponding "RX" LED on the input circuit. Port 1 on Main Board, port 2 (J300X) on Power Board.

Flickering LED indicates that signal is received.

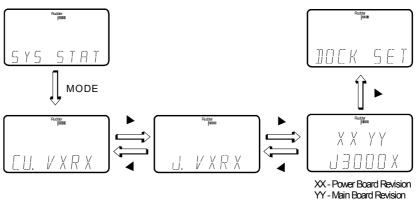
However, there may still be a problem with baudrate, polarity and stop bits.

Note!

The Junction unit also has a NMEA "TX" LED that will flicker whenever the autopilot is on. (Sending heading and rudder angle data.) Make sure this "TX" LED is not mixed up with the "RX" LED when checking for incoming data.

Press > to proceed to the System Status check.

5.6 System status



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The system state feature allows you to read the software version of the control unit and the junction unit and also the revision of the Power Board and the Main Board in the junction unit.

Activate the SYS STAT display by pushing MODE once. Step through the display readings by pushing < or >.

5.7 EXIT

Use a quick push on the STBY/AUTO button to exit the installation menu.

6 TECHNICAL SPECIFICATIONS

6.1 System Specifications

Boat types:..... Power and Sail

Steering system types: Hydraulic, Mechanical

Max. number of control units:.... 2

System ON/OFF: From control unit

Power consumption: Dependent on system configuration

Environmental Protection:

Control Unit:IP67

RFC35 Compass:.....IP56

RF300 Rudder Feedback:...IP56

Junction unit:.....IP44/IP22

EMC protection:.....EN50081-1, EN50082-1

Autosteering control:

Rudder Drive:Proportional Rate or solenoid operation

Parameter selection:Automatic with manual override

Sea state control:.....Adaptive sea state filter and manual setting

Language: English

Electronic Interface:

Navigation interface:.....NMEA 0183, Dataline instruments, Databox

Input ports:1 (Sentences: APB, APA, BWW, RMA, RMB,

RMC, VHW, VTG, VWR, XTE, XTR).

Output ports: (Sentences: HDM, HSC, RSA)

Heading sensors: RFC35 Electronic Fluxgate Compass,

Magnetic Compass with CD100 Course Detector $\,$

CDI35 Course Detector Interface

Alarms: Audible and visual

Steering modes: Standby, Non-follow up, Auto-Compass,

Auto-Navigation, Auto-Wind

Special Turn modes:...... U-turn, Tacking, Dodge

6.2 AP11 Control Unit

Mounting: Flush panel mount or bracket mount (option)

Weight: 210 grams

Display:..... Backlit LCD display

Illumination...... Adjustable in 4 steps (Off + 3 levels)

Resolution:

Top line:30 bar elements to each side

Middle line:Four 7 segment characters plus direction arrows

Bottom line:Eight 14 segment characters

Push buttons: Tactile silicone pads

Material: Polycarbonate

Colour: Black or white (optional) clip on bezel

Environmental Protection:..... IP67

Safe distance to magnetic compass: 0.1 m

Temperature:

Operating: 0 to $+55^{\circ}$ C (+32 to $+130^{\circ}$ F)

Storage:-30 to +80°C (-22 to +176°F)

Alarms: Audible and visual

6.3 J3000X Junction Unit

Input supply voltage: 10 - 28 V DC

Reverse voltage protection...... Yes

Power consumption: 5 Watt (J3000X electronics)

Motor / solenoid drive:................ 6 A continuous, 10 A for 5 seconds

Output drive voltage: 12/24 V DC

Proportional rate or ON/OFF (solenoids)

By-pass / clutch output: 12/24 V DC 1.5 A max

Heading Sensor input: Composite pulse width modulated

Rudder feedback input:............. 3400 Hz., 20 Hz/deg.

Rudder feedback units: RF300 or LF/LFI3000 (optional)

ROBNET network interface:...... 3xtwisted pairs for data, supply, ON/OFF

NMEA 0183 input/output: 1 Input/output port

Remote Control:..... Stby/Auto mode select, push button steering and

course change.

Weight: 1.2 Kg (2,6 lbs.)

Environmental Protection:...... IP44 for electronics, IP22 for terminals

Temperature range:

Operation:0 to $+55^{\circ}$ C (+32 to $+130^{\circ}$ F)

Storage:30 to +80°C (-22 to +176°F)

6.4 J300X Junction Unit

As for J3000X with the following changes and additions:

Motor/solenoid drive: 10A continuous, 20A for 5 seconds

NMEA0183 Input/output: 2 Input/output ports

Radar clock/data output:..... For Anritsu and Furuno Radars

External alarm: Open collector output (0,9A) for relay or buzzer

6.5 RFC35 Fluxgate compass

superimposed pulse width modulation

Automatic Performance:

Calibration:Automatically activated by control head

Gain compensation:Automatically adjusted continuously

Repeatability: \pm 0.5 degrees

Roll/Pitch: ± 35 degrees

Accuracy: ± 3 degrees after calibration

Cable supplied: 15 m TP shielded cable

Weight: 0,9 kg including cable (2,0 lbs.)

Power consumption: 0,9 watts

Temperature range:

Operation: 0 to $+55^{\circ}$ C (+32 to $+130^{\circ}$ F)

Storage:-30 to +80°C (-22 to +176°F)

Environmental Protection:..... IP56

Mounting: Deck or bulkhead

Material: Black ABS

6.6 CDI35 Course Detector Interface

Automatic Performance:

Calibration:Automatically activated by control head

Gain compensation:Automatically adjusted continuously

Repeatability: \pm 0.5 degrees

Accuracy: $\pm 0.5^{\circ}$ (not including errors from course detector)

Cable supplied:...... 15 m TP shielded cable

Weight: 0,9 kg including cable (2,0 lbs.)

Power consumption: 0,9 watts

Temperature range:

Operation:0 to $+55^{\circ}$ C (+32 to $+130^{\circ}$ F)

Storage:-30 to +80°C (-22 to +176°F)

Environmental Protection:..... IP56

Mounting: Deck or bulkhead

Material: Black ABS

6.7 RF300 Rudder Feedback Unit

Rudder angle: +/- 90 degrees

Output signal: Polarity independent variable frequency

Frequency resolution: Center: 3400 Hz, 20 Hz/degree of change

Linearity:+/- 3 degrees up to 45 degrees of rudder

Power consumption: 0.3W

Cable supplied: 10 m twisted pair shielded cable

(4 in. dia. x 2.6 in. high + Transmission arm)

Mounting: Horizontal, vertical, upside down

Weight: 0.6 Kg including cable

Transmission link: Stainless, 350mm (13.8") with 2 ball joints

Material: POM/PBT

Environmental Protection:...... IP56

Temperature range:

Operation: $-10 \text{ to } +55^{\circ}\text{C} \text{ (} +14 \text{ to } +130^{\circ}\text{F)}$

Storage: $-30 \text{ to } +80^{\circ}\text{C} \text{ } (-22 \text{ to } +176^{\circ}\text{F})$

6.8 LF3000 Linear Feedback

Stroke: 300 mm

Operating principle: Variable differential transformer, excitation and

signal conversion by separate LFI3000 Interface

unit

Power: Supplied by LFI3000

Mounting: Clamped to hydraulic ram

Material: Rod: Stainless

Tube: Epoxy coated sea water resistant

aluminium

Environmental protection:...... IP67

6.9 LFI3000 Mk2 Feedback Interface

Supply: From Junction Unit

Output signal: Polarity independent variable frequency

Frequency resolution...... Center 3400Hz, 20Hz/degree equal to 1,7 mm

travel

Linearity: ±3 degrees up to 45 degrees of rudder

Cable supplied: 1,5 m TP shielded cable

Weight: 0,7 kg including cable (1,6 lbs.)

Power consumption: 0,9 watts

Temperature range:

Operation:0 to $+55^{\circ}$ C (+32 to $+130^{\circ}$ F)

Storage:-30 to $+80^{\circ}$ C (-22 to $+176^{\circ}$ F)

Environmental Protection:..... IP56

Mounting: Deck or bulkhead

Material: Black ABS

7 AP11 AUTOPILOT SPARE PARTS LIST

AP11 Control unit

22085203	AP11 Control unit with installation accessories
22085237	AP11 Control unit
22085278	Installation accessories
44164317	Front cover
44164408	Cap strip digital buttons
22085419	Seal plug, back plate
44162410	Protection cover
22081863	7 m cable, (3xTP, shielded)
44160810	Screws no. 6 self-tapping(4 ea.)
22081905	Template

Junction Units

22081053	J300X Junction unit with installation accessories
22081830	J300X Junction unit (only)
22081707	Installation accessories
22081715	J300X Power PCB assy.
22081285	J300X Main PCB assy.
22081640	EPROM for J300X/J3000X
22081434	Base plate
22081350	Main cover
22081368	Terminal cover
22081046	J3000X Junction unit with installation accessories
22081822	J3000X Junction Unit (only)
22081855	Installation accessories
22081251	J3000X Power PCB assy.
22081285	J300X Main PCB assy.

22081640	EPROM for J300X/J3000X			
22081434	Base plate			
22081350	Main cover			
22081368	Terminal cover			
	RFC35 Fluxgate Compass			
22081079	RFC35 Fluxgate Compass with installation accessories			
22081459	RFC35 Fluxgate Compass (only)			
22081442	Installation accessories consisting of:			
	20104972 Mounting bracket (2 ea.)			
	44140762 Screw 3.5x25 (4 ea.)			
	44140770 Screw 30x9 (2 ea.)			
	22081376 Plug (4 ea.)			
22081178	RFC35 PCB assy.			
RF300 Rudder Feedback Unit				
20193447	RF300 Rudder Feedback with transmission link			
20193462	RF300 Rudder Feedback			
20193454	RF300 transmission link			
44133122	Transmission rod M5x325mm			
20193470	RF300 Transmission lever			
20193624	RF300 Ball joint ass'y			
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Terms of Warranty

Simrad Products

SIMRAD warrants that every product shall be free of defects in material and workmanship as specified below:

CATEGORY "A":

- Autopilots Radars Instruments Navigators Radiotelephones Plotters
- Gyro compasses incl. sensitive elements Sonars Echo sounders
- Trawl Instrumentation.

These products are warranted for a period of 24 months on parts and 12 months on labour from date of purchase, except for category B items. Consumable parts such as lamps, fuses, batteries, bearings etc. are not covered by this warranty.

CATEGORY "B":

- Antennas Transducers Trawl sensors Monitors (CRT/LCD) Radar magnetrons
- Disk drives.

These items are warranted for a period of 12 months on parts and labour from date of purchase.

WARRANTY SERVICE is available through authorised service dealers or national distributors worldwide. Products returned will, at the sole discretion of Simrad, either be repaired or replaced free of charge within normal working hours. Freight charges, insurance, duties or any other costs are the responsibility of the customer.

Maximum liability shall not, in any case, exceed the contract price of the products claimed to be defective.

ON BOARD SERVICE can be arranged by authorised local service dealers or national distributors upon request. Labour costs for the repair/replacement of the defective modules/parts will be free of charge provided a valid warranty is confirmed. Overtime, travel, lodging, per diem, insurance, duties or any other costs are the responsibility of the customer. Additional expenses connected with replacement of transducers such as dry docking, diving and precautionary measures are not covered by this warranty.

VALIDITY: This warranty is effective only when warranty certificate or proof of purchase and equipment serial number is presented. Furthermore, the installation and operation has to be carried out in accordance with the product manual. Warranty liability does not apply to any equipment which has become inoperative due to misuse, accident, neglect, sea water damage or unauthorised repair. Simrad will not be liable for any loss, incidental or consequential damages whether based upon warranty, contract or negligence, or arising in connection with the sale, installation, use or repair of the product. Consequential damages include, but are not limited to, any loss of profit, property damage or personal injury.

The terms of warranty as described does not affect your statutory rights.

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The above companies represent only main importers. Each country is in addition served by a network of local service outlets.

Some importers represent only specific market segments according to the following codes: Professional: Coastal and Fishery market Recreational: Leisure market



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